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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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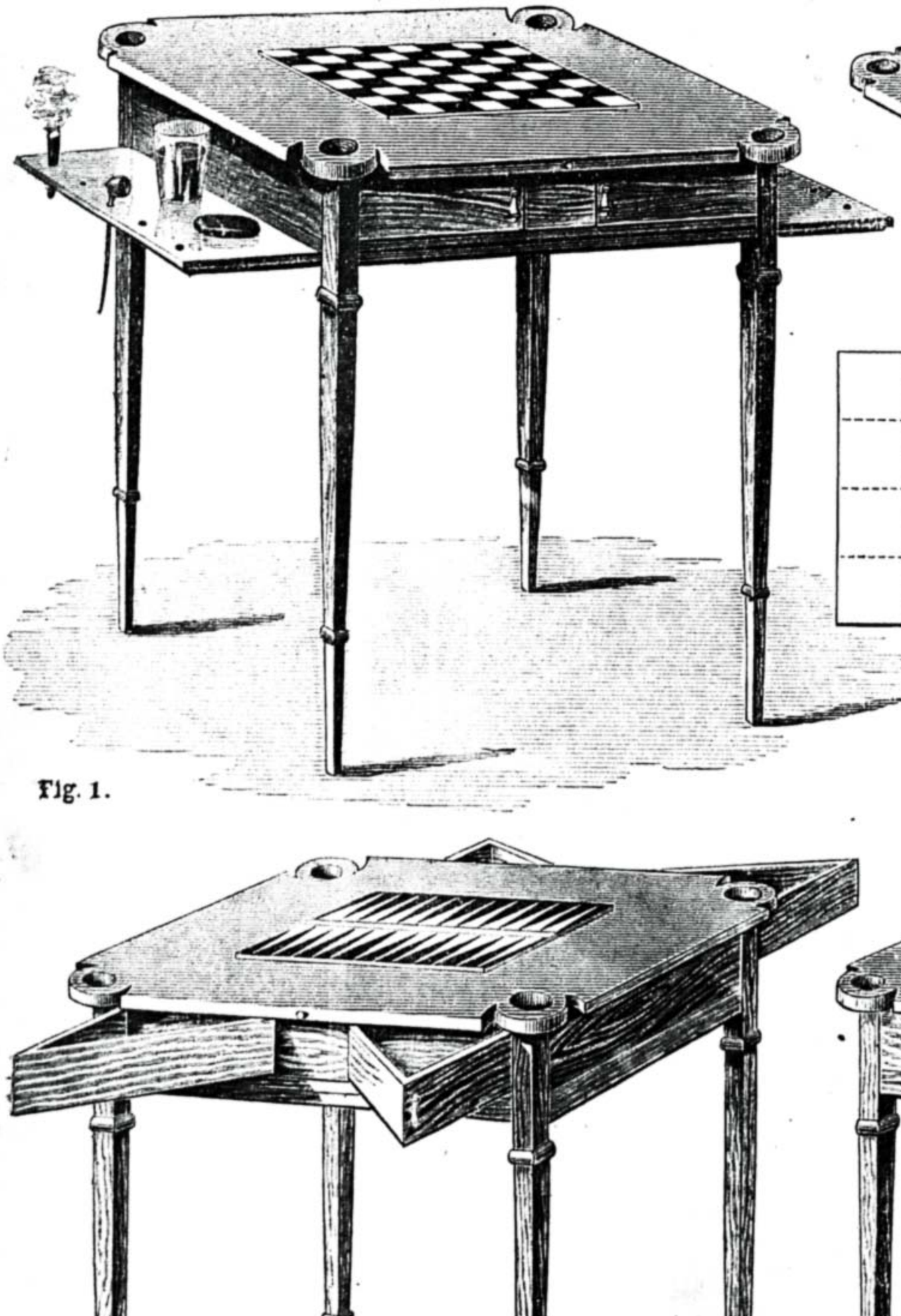
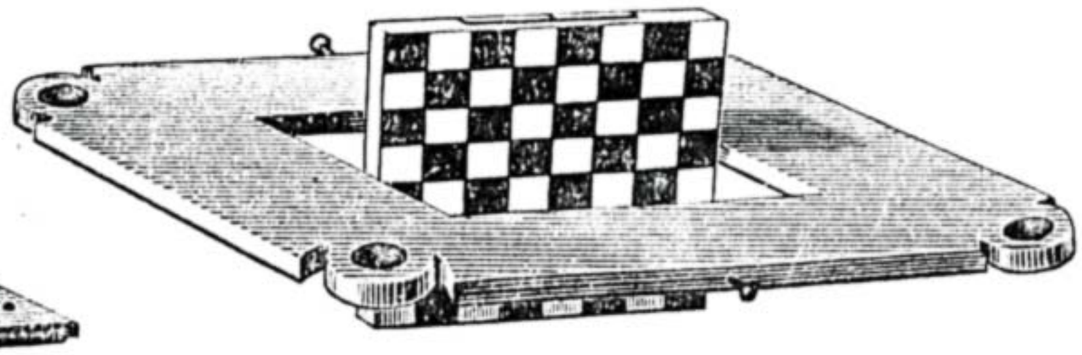


Fig. 1.



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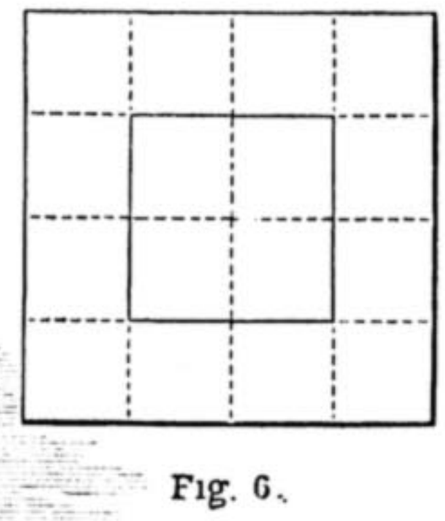

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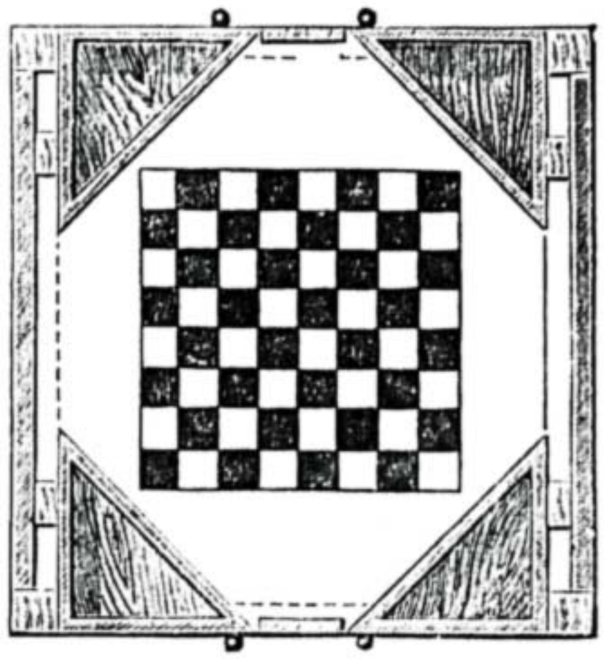

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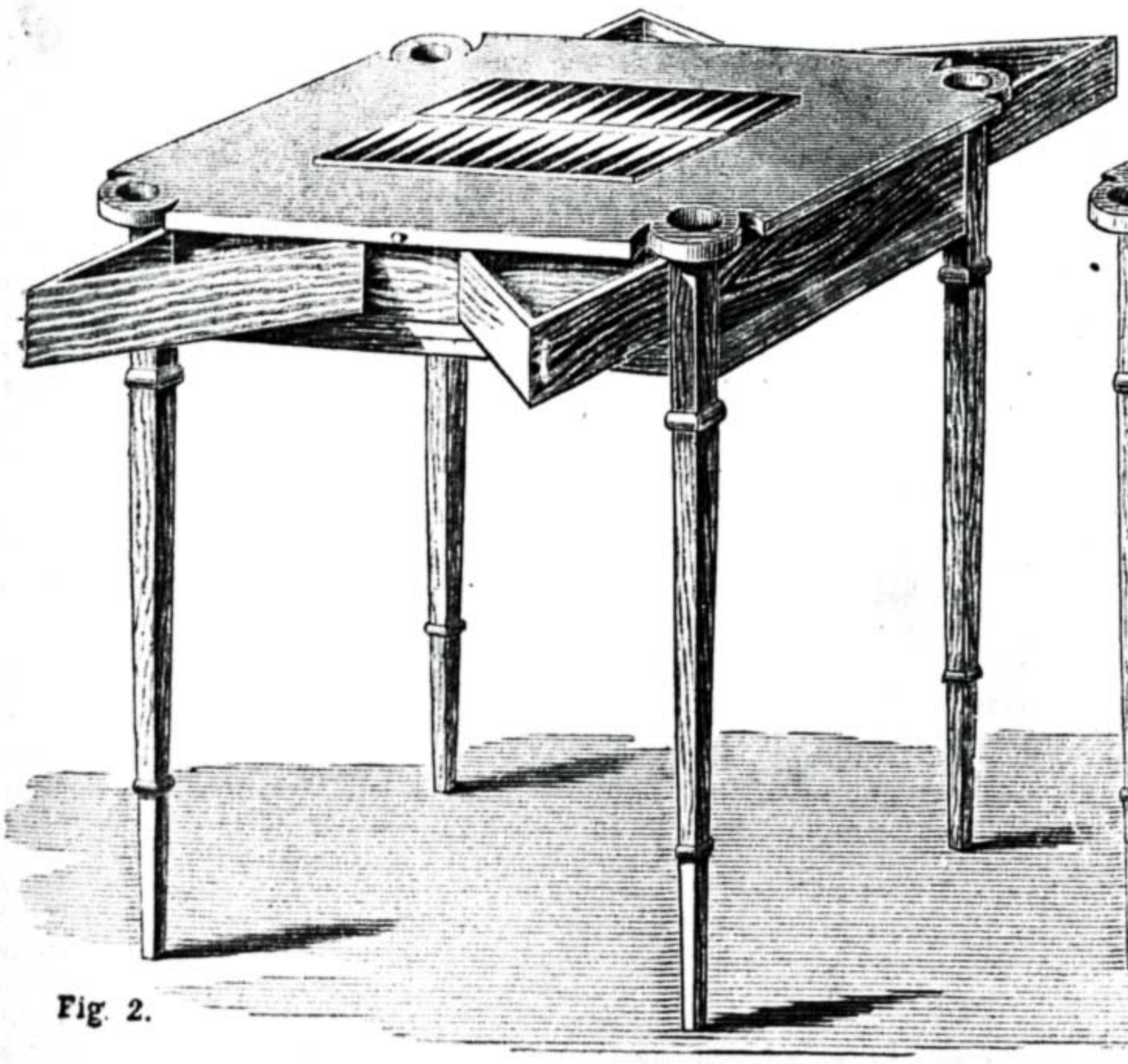

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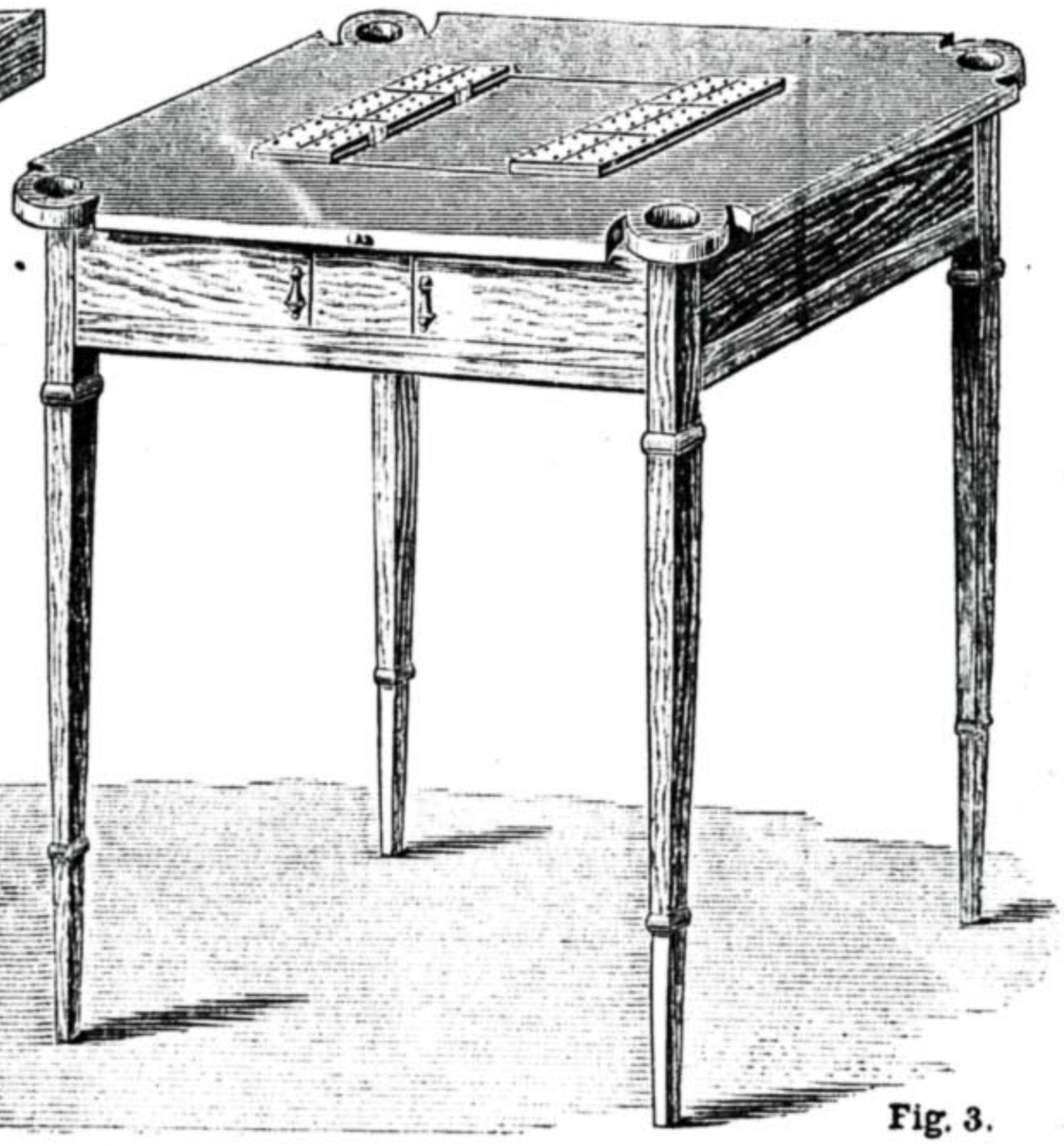

Fig. 3.

A NOVEL CHESS, BACKGAMMON, AND CARD TABLE.

Fig. 1.—As Chess Table. Fig. 2.—As Backgammon Table. Fig. 3.—As Card Table. Fig. 4.—Showing how Chess Board revolves. Fig. 5.—Plan of Table showing Triangular Boxes or Drawers. Fig. 6.—Diagram showing Proper Proportionate Size of Chess Board in relation to Table Top.

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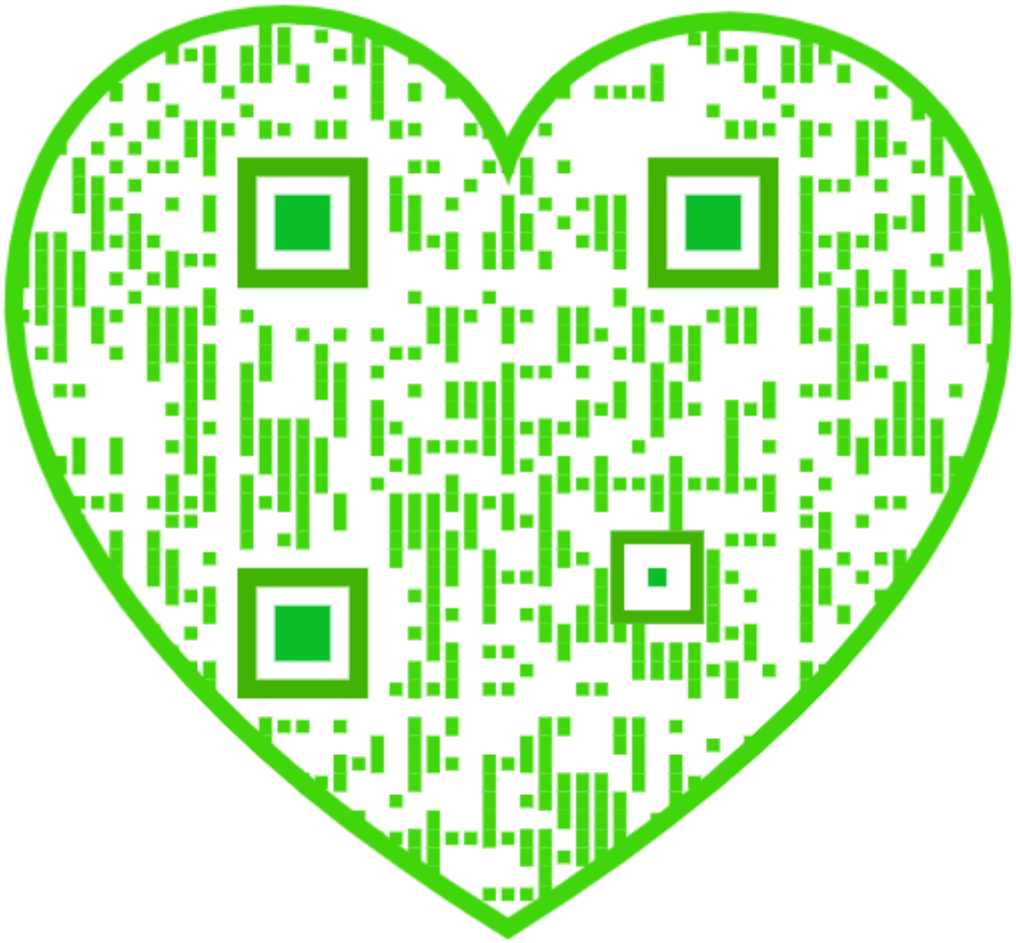


A NOVEL CHESS, BACKGAMMON, AND CARD TABLE.

BY JAMES SCOTT.

NEARLY every nation in the world has to grieve over the spirit of gambling which exists to a more or less extent in mankind as a whole.

Men, both those who belong to the clergy and the laity, have striven energetically in, and deserve praise for, their endeavours to quell the desire that is rooted in most men for participating in games of chance, or speculating upon coming events in various directions. But there are undesirable extremes even in intended philanthropy; and it is to be sincerely regretted that some of the gentlemen, who certainly merit reward for their good intentions, push matters to a further extent than is really needful, by tendering their opinions that until games of all descriptions, where two or more sides are opposed to each other, become extinct, the gambling tendency will continue to receive nourishment in every rising generation.

I have somewhere read a very able essay upon the state of society during the Puritanic times of a comparatively recent reign (Charles I.—Cromwell) in this country, which also described the demoralised condition of the community which resulted as an after-effect; and it was therein hinted that the same things would again happen if the masses and classes were purified beyond a reasonable limit. All this appeared to me to contain nothing but truth. Deprive men of their recreations, and for a time all would seem well; but the very goodness gained would be the evil, for upon the slightest opportunity there would be a rush of immorality a hundredfold stronger than was previously the case. A man washes his face in clean water: he becomes clean; the water becomes dirty. If that water is then allowed to remain, it turns impure and creates evil—it was at first the purifier. In like manner, when a supposed good condition had been arrived at in relation to mankind's morality, the men who had accomplished such a result would have no further occupation in this direction, and would allow the goodness to remain thus until suddenly the lurking dangers within it burst forth in terrible power.

Perhaps I am too philosophical in my remarks, but my aim is to show that because some men ruin themselves by gambling for money at cards, etc., insufficient reason is adduced thereby for the abandonment of the games by anyone or everyone who may desire to play at such for purposes of recreation. I think I am not far wrong in saying that those things which are abused to the greatest extent are those which, if indulged in in sensible moderation and used legitimately, morally speaking, in the latter cases afford much benefit to us.

I will not enter further into these questions, for fear of being unable to extricate myself honourably from the intricacies in which one so soon gets entangled and muddled; but will proceed to explain the purposes, advantages, and drawbacks—nay, it has none—of the small table which I have evolved for my readers out of the head which I have been told frequently by a certain near relative is made of a similar material to that which most people would make this table with.

Here is an article which can be made in any size—we will say, for example, 2 ft. square—and can be used as a chess, backgammon, and card table. In a very simple manner the middle portion of it revolves, so that the table is altered respectively for use in connection with the three games named. No one requires the table top to expose all three conditions at the same time; at least, I have never heard of anyone playing at chess while his opposite companion played with him at cards. The alterations can be effected in the table without any necessity existing for the players to rise from their seats.

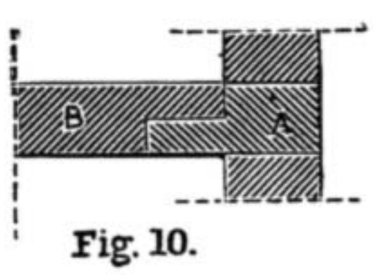
Under the table there will be two boards, capable of being drawn out as in Fig. 1, whereon a glass of ale or ginger beer can be placed, thus leaving a clear space on the top of the table. Then there are a few holes in these side flaps wherein can be accommodated lighted pipes and cigars; and I feel certain that this simple arrangement will be appreciated, for although I at present do not indulge much in pipes and cigars—I relish the milder cigarette in large quantities, as does a fellow-contributor, according to his own account—I am aware that such things are apt to burn anything upon which they are indiscriminately laid.

The drawer compartments differ from the usual thing. Most people know how inconvenient it is, when one is sitting at a table, to open a drawer which may be upon that side of the table where one sits. These boxes or drawers are hinged to open out at each side of the player, and will cause as little annoyance as possible. The shape of them is incumbent, for there must be a clear open space underneath the table to allow the chess, etc., board to revolve.

The table top will be square, and whatever may be the size of it, the middle revolving chess board must be one quarter of it—*i.e.*, the top would be divided into sixteen equal parts, as in Fig. 5, of which the four middle ones would represent the space occupied by the chess board. I will describe the latter first. Supposing the table top to be ¾ in. thick, the chess board will be about 1 in. thick at two ends of it and ¾ in. in the middle portion, which latter comprises one half of it. Two boards, ¼ in. thick, will be hinged respectively to the inner edge of each projection, as in Fig. 7, each board of course being in width equal to a quarter of the chess board's width.

On the side of this combination board, which is quite level, will be painted black and white squares, their number being, as most people are aware, black thirty-two, white thirty-two. The reverse side of this board will be painted for backgammon; there being on each half of it twelve black and twelve white portions, the point of each triangle of one colour being between the sides of the other triangles. The two small flaps are then folded over, one to each side, as in Fig. 7, and small holes drilled partly through them for purposes of which most readers will be acquainted with. In Fig. 9 I show a plan of a cribbage board. There should be a small hook and eye to connect the boards when upside down.

The chess board is placed in a square hole in the table top, chess side undermost, while a quarter of its thickness, in which are contained the two cribbage boards, is allowed



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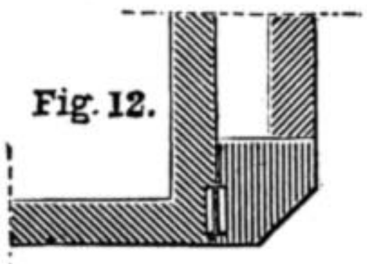

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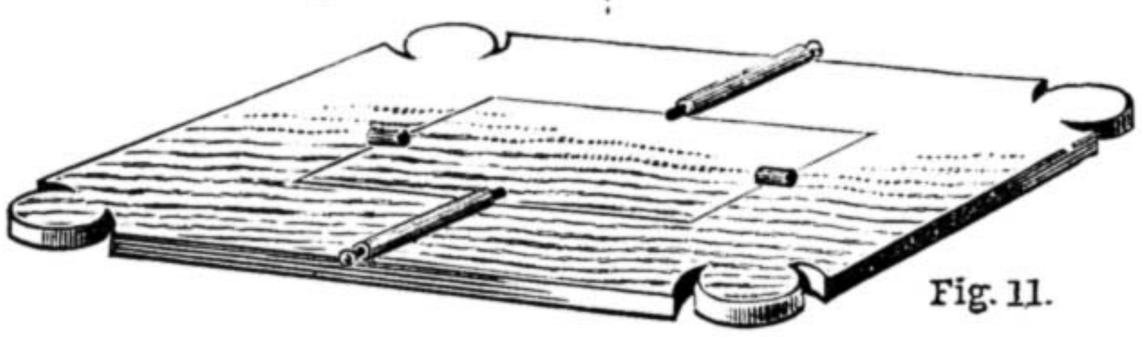

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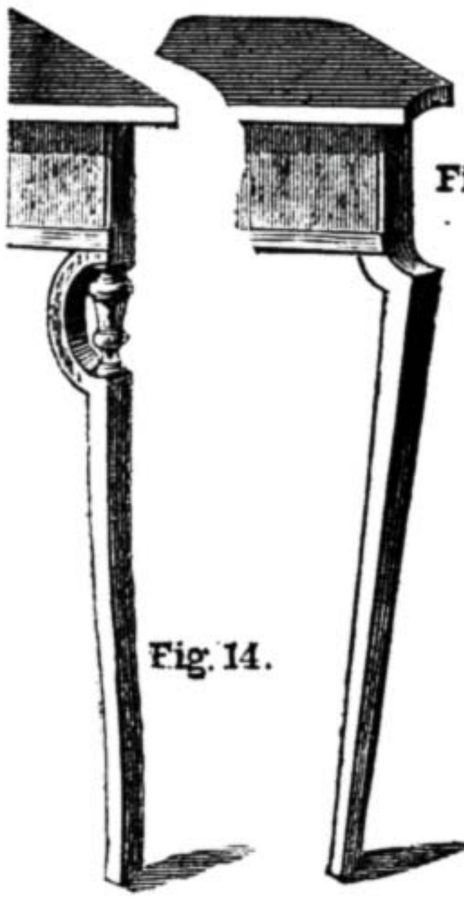

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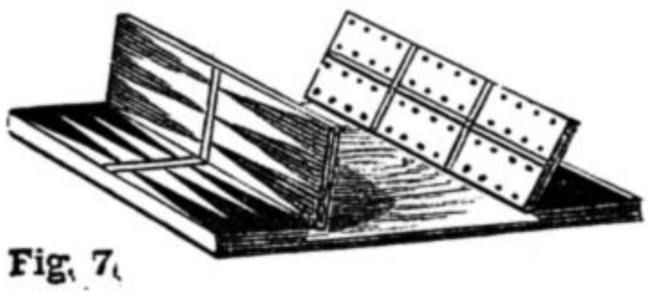

Fig. 7.

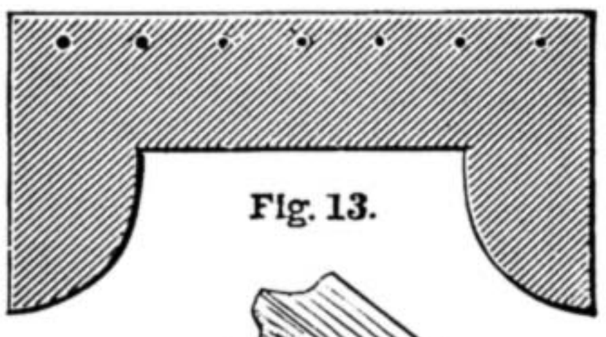

Fig. 13.

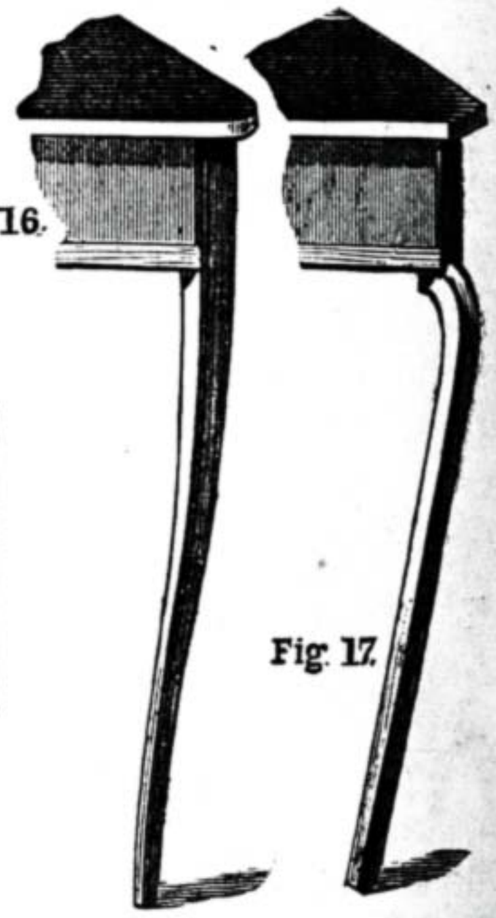

Fig. 16. Fig. 17.

Fig. 14.

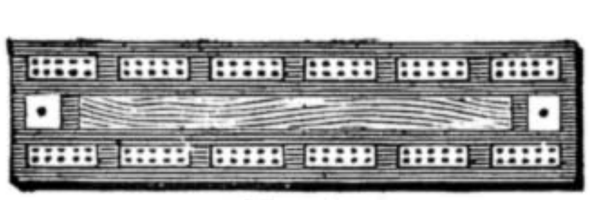

Fig. 9.

Fig 8.

Fig. 7.—Reverse Side of Chess Board. Fig. 8.—Joint for Cross Rails under Table Top. Fig. 9.—A Cribbage Board. Fig. 10.—Section showing Side Shelf (B) and Rabbeted Rail (A). Fig. 11.—Alternative Method of securing Chess Board: under view. Fig. 12.—Plan of One Corner under certain circumstances. Fig. 13.—Plan of Side Shelves. Figs. 14, 15, 16, 17.—Patterns of Suitable Legs.

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to remain above the main surface of the table top, and there pivoted by holes being bored completely through the width of the table top. Only two opposite points must be fixtures, and it is unimportant which way the board revolves.

At the sides of the table, holes should be drilled right through the width and partly through the chess board. Through these two holes will pass metal or wooden rods, each having a small knob or ring at the outside end. Thus, when the players wished to alter the table, each would draw out the rod on his side of it for an inch or so, and after the chess board was properly turned, would place it back again; in this way retaining all in a steady condition.

As an alternative, narrow tubes could be secured under the table top and chess board, as in Fig. 11, and the pivots and rods passed through them. This saves drilling such long holes; but if this method is adopted, the chess board will have to be fitted to work much looser than it need otherwise be; and it would be advisable to round off the edges. The chess board, too, would not lay flush with the table surface when adjusted; indeed, it would be below the thickness of it.

The table legs may be dowelled to the table top. They must be joined in such a manner that they will be square with the table, as shown in Fig. 5. I have given several different patterns of legs in Figs. 14-17. Where a flat surface is shown as running cornerways to the table top, the leg will be shaped in section, for part length, and fitted as in Fig. 12. A framing, about $\frac{3}{4}$ in. deep and $1\frac{1}{2}$ in. or $1\frac{1}{4}$ in. in width, should be joined to each side of the table between the legs. The right and left-hand sides between the table top and this framing will be fixtures. Across the table, between the framing, might be two rails, the joints used to connect them being something similar to that shown in Fig. 8.

Under the framing at the front and the back of the table will be joined rabbeted rails, as shown in Fig. 10 (A), in such a way that part of their length will project beyond the legs towards the middle line of the table. Along these rails will travel the flaps (Fig. 1), whose end edges must be shaped as shown in Fig. 10. The width of each flap will depend upon the depth of the table sides, which latter might conveniently be 4 or 5 in. If the table top is 2 feet square, the chess board will be 1 ft. square, which, when revolving, will require a depth of 6 in. to allow it to do so; so that if the table sides are 6 in. deep, each flap can be as wide as half the table framing. The flaps, or shelves, may be cut as in Fig. 13. It is only necessary to allow room for the chess board to revolve; therefore, the two ends of each flap can be equal to half the width of the table proper. Underneath each flap there should be a notch of some sort to facilitate the drawing in and out of it.

Returning to the drawers or boxes, it must be remembered that they also must be made to permit the chess board to revolve. Plan, Fig. 5, shows this. The sides may be as long as I show, for the drawers would only be opened when the chess board was adjusted. The hingeing and fixing of the handles need no explanations. Between each drawer, at the sides where they open, will be joined a small board to close the side up properly. Little blocks of wood could be glued inside the table, against the fixed sides, as stops for the drawers when the latter are closed.

The shape of the table top could be varied infinitely. The circles indicate small globular cavities, suitable for containing such things as card counters, etc.

The finish of the table and the choice of the material are left to the reader's discretion. Finally, I may be permitted to remark that this simple, yet novel and useful, little article ought to be found serviceable in any workman's home, and that in many a workingman's club it would also prove accommodating.

MODERN FORGING.

BY J. H.

BOSSED LEVERS—ECCENTRIC AND VALVE RODS—SLIDE-VALVE SPINDLES—BRIDLES OF VARIOUS FORMS.

IT is often the case that the arms of bossed levers have to stand at right or other angles with each other, and also are not in the same plane: then the methods described (p. 544) are not applicable. Fig. 73 shows a portion of a lever, with arms at right angles to each other, and placed on opposite sides of the boss. There are two ways in which these levers may be attached to the boss. One is by "dabbing on"—that is, the arm A, with a portion of the boss, is welded flat upon the main portion of the boss B, along the plane *a*, the surfaces being first hatched over with the corner of a set; in the other (Fig. 74), one side of the boss is fullered, as at A, with a round-faced fuller (Fig. 75), and the end of the lever arm B is upset, and the two welded together. This is a very common method of welding. Note that the fuller not only indents the boss, but, by means of blows delivered diagonally, is made to throw up the metal all around in a ridge, thus giving some extra metal for finishing off. In Fig. 74 C is a die-block, in which the boss is held while the arm is being welded; D is a thickness piece, or washer; E, the anvil. If no die-block is available, the boss will be held with large, open-mouthed tongs of rudely globular form.

Eccentric and valve rods afford some good typical examples of engine forgings. The eccentric rod (Fig. 76) is not usually made in one piece, but in two, and welded at about the centre; or, if rather long, the ends are welded to a central plain bar.

The extreme dimensions of the end A represent roughly the original size of the bar, from which the shank B is drawn down. From that original bar there is swaged down a length sufficient for welding. The large end is cut off to the precise length required with the knife tool (Fig. 77), or with the curved knife (Fig. 78) if the steam-hammer is used, or with a hot set if power is not available. Then it is necessary to cut off any sharp corners upon the anvil with a cutting-off tool, giving the appearance of Fig. 79, and swage the end A, rounding with a hollow swage, letting the shoulder B lay against the beak of the anvil, and finally finish in a die-block (Fig. 80). Of course the die-block is only used for finishing when the quantity of forgings required is sufficient to pay for its expense.

The body A of the block is of cast iron, and a wrought iron ring B is shrunk on. The recess C, it will be seen, corresponds with the outline of the end A in Fig. 76.

Another way to forge the forked end is to take a bar about half the thickness of the forked end, and double the iron over, and weld a length that will extend rather farther than the termination of the radius.

In both of these methods the gap may be cut out roughly by the smith, or left to be machined out. The general methods of forming forked ends were shown in a previous paper, and now I need only show by a sketch how the shape of forked ends whose gaps are formed by forging, and not by machining, is imparted. After the metal has been cut out from the gap and roughly brought to form, a filler, shown shaded at C, Fig. 76, is inserted, and the outside of the forked end finished with flatter and hollow swage, while the filler remains in. The filler is usually furnished with a square shank to fit the square hole in the anvil.

The end D in Fig. 76 is made by one of three methods. The shank B is either fullered down from a bar of the original section of the end D; or the shank A (Fig. 81) is welded to a piece of flat bar B, of the dimensions of the end D in Fig. 76; or the end of a bar is divided and opened out (Fig. 83). The first method is not correct in principle, because the grain fibres are short, but it is often adopted; and there is not very much stress on the flat end when bolted up to the eccentric straps, and the hammering it receives at the welding heat helps to consolidate the metal. The second method has the advantage of preserving the best arrangement of the fibres. In this method the flat piece A (Fig. 81) is fullered and upset with a round-faced fuller, like Fig. 75, and the end B, similarly fullered, is welded to it. In either case the section of the iron selected is a trifle larger than the finished section, to permit of finishing off. In the case where the shank is drawn down from the solid, a good deal of finish with the flatter on face *a* (Fig. 76) has to be done, the rod being held vertically, with the face D upon the anvil face. To prevent the rebounding backwards of the forging, in consequence of the edge of the flatter striking the shank, a turned round bar of iron (Fig. 82, A) is fitted with a shank into the hole on the anvil face. The flatting of the inner face *a* of course has a tendency to spread the edges and bulge them in some places, and this is corrected with hammer blows, and blows from the flatter on those edges.

A third way of forming the flat end is by forking the end of a stout bar in the fashion shown in Fig. 83, and opening the ends outwards. Continuity of fibre is thus preserved. The end A is then fullered down thinner, and drawn out—cut off the main bar, whose length may serve as a porter—and scarfed for welding to the stem.

When these rods are made in quantity the final finish is imparted in a cast-iron die of the form shown in Fig. 84, where A is the recess that gives the flat end its perfect finish, and B a flat piece of steel, whose depth B makes up the precise difference between the depth C and of the flat end A, and by means of which the T-end is driven out of the die immediately after it is turned off the anvil block of the steam-hammer. The block being turned upside down, a blow or two on the piece B drives out the finished T-piece, and releases it from the die.

When the fins formed at the edges are being cut off with the set, the forging is placed upon a piece of sheet iron, bent over at the ends to clip the edges of the anvil. This sheet of iron prevents the cutting edges of the set from becoming dulled by contact with the hard steel face of the anvil.

Slide-valve spindles of the bridle form are made in two or three ways. The bridle is sometimes of circular, sometimes of

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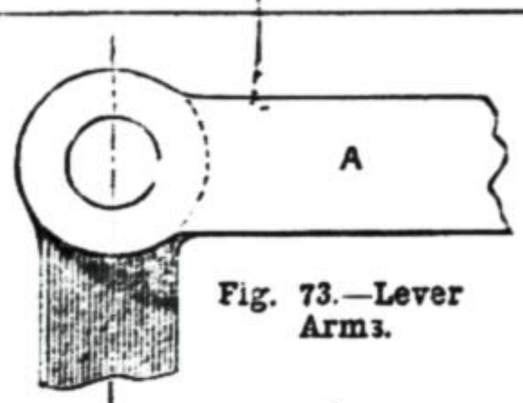
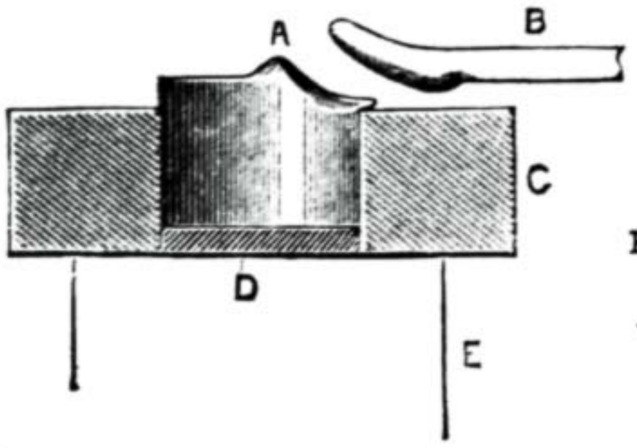


Fig. 73.—Lever Arms.



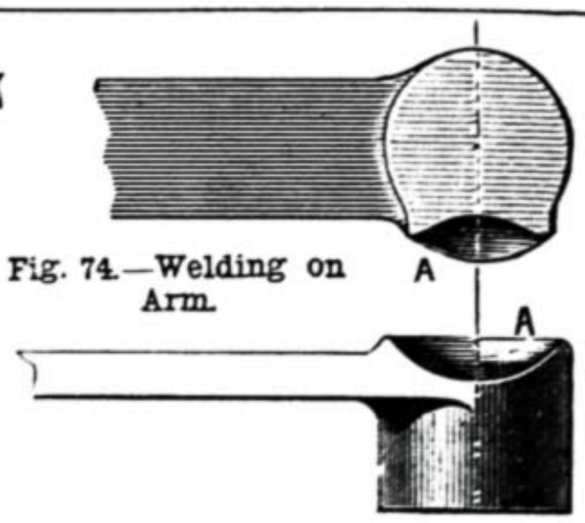


Fig. 74.—Welding on Arm.

Fig. 75.—Round-faced Fuller.

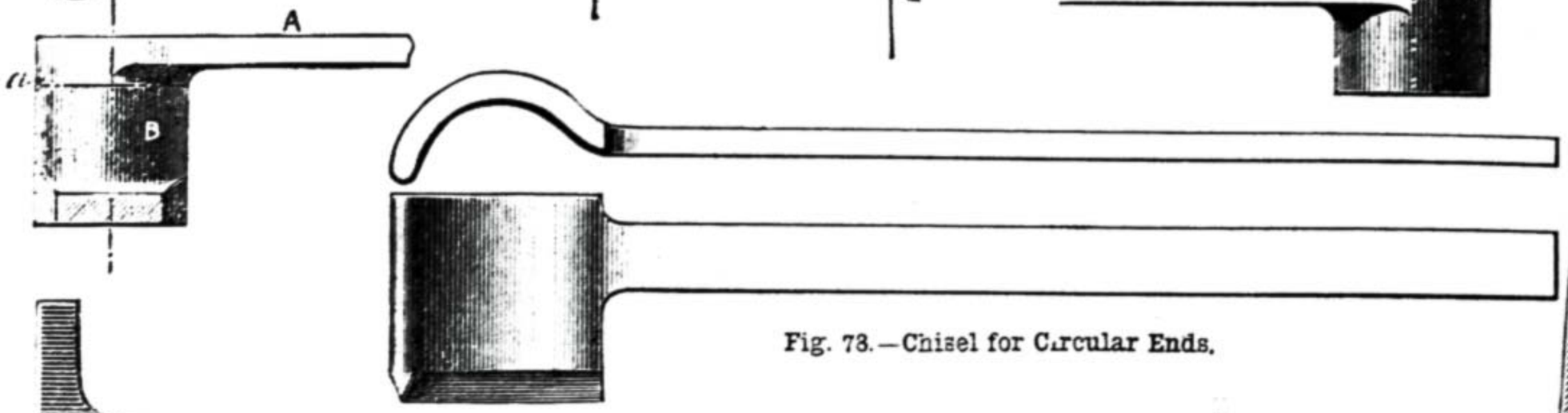


Fig. 78.—Chisel for Circular Ends.

Fig. 86.—Sugar-loaf Casting.

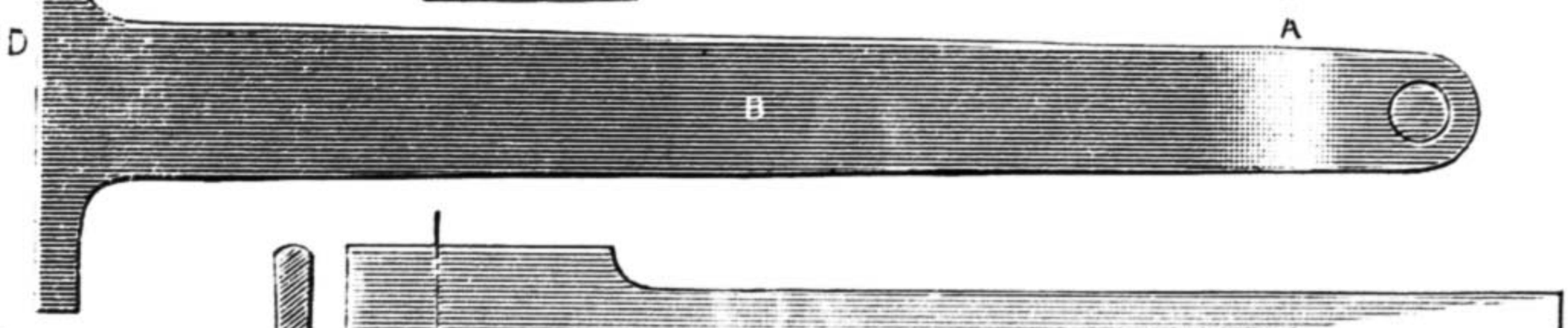


Fig. 76.—Eccentric Rod.

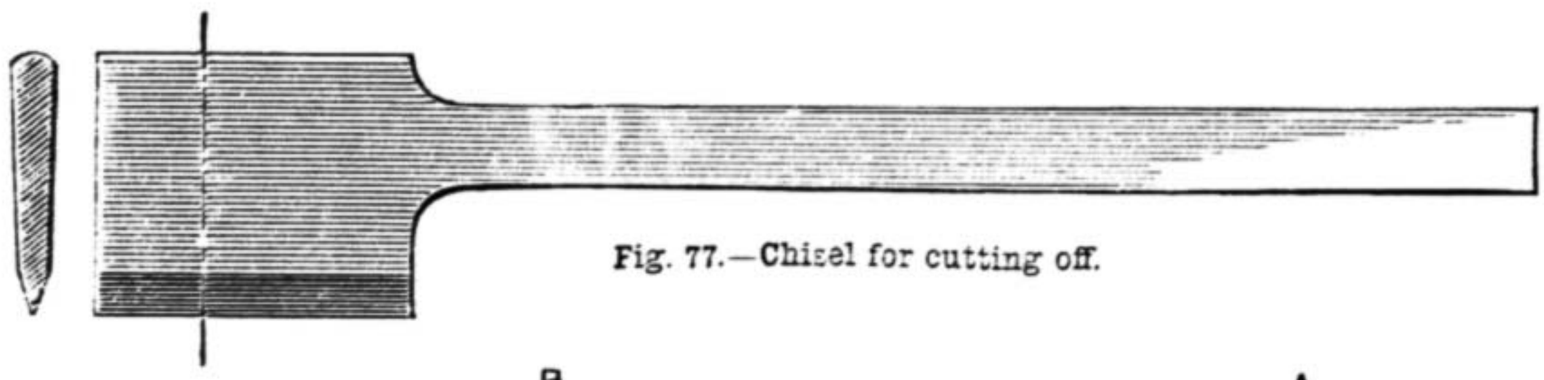


Fig. 77.—Chisel for cutting off.

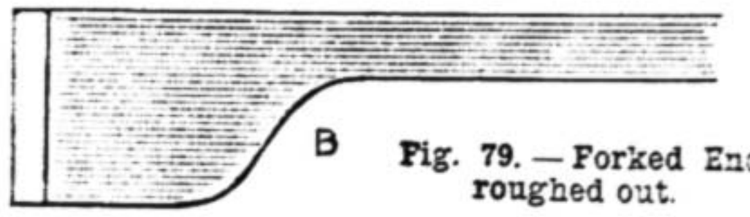


Fig. 79.—Forked End roughed out.

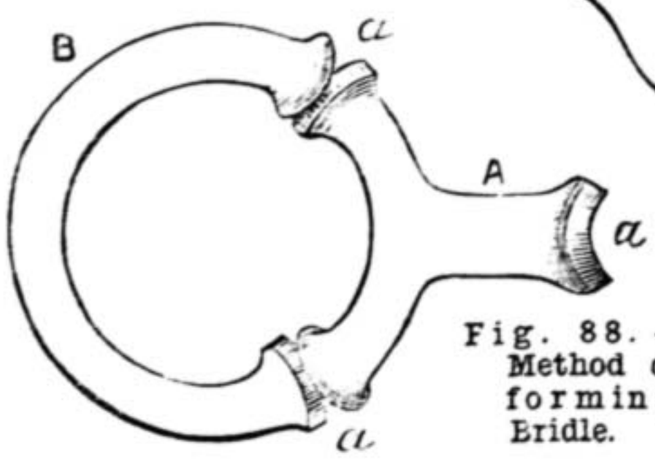


Fig. 88.—Method of forming Bridle.

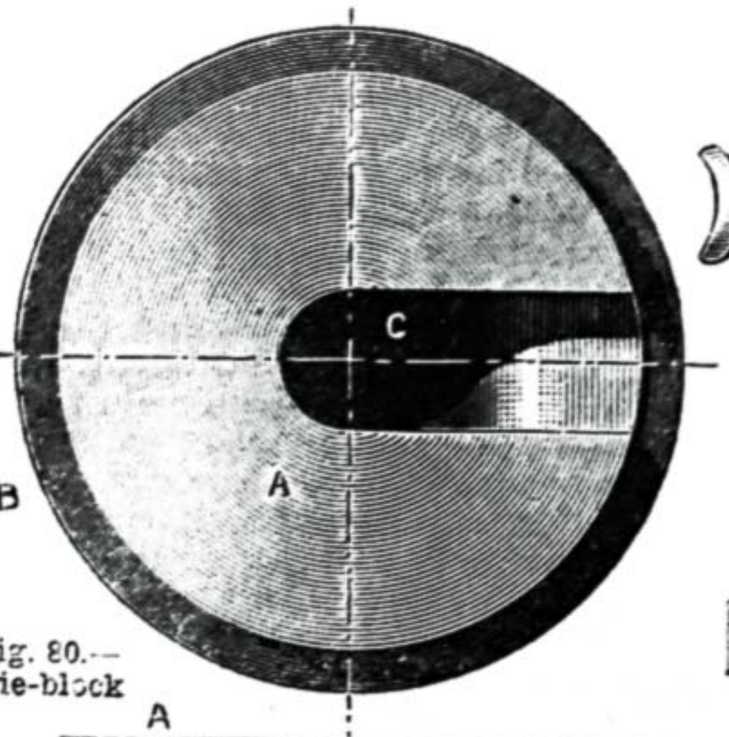


Fig. 80.—Die-block

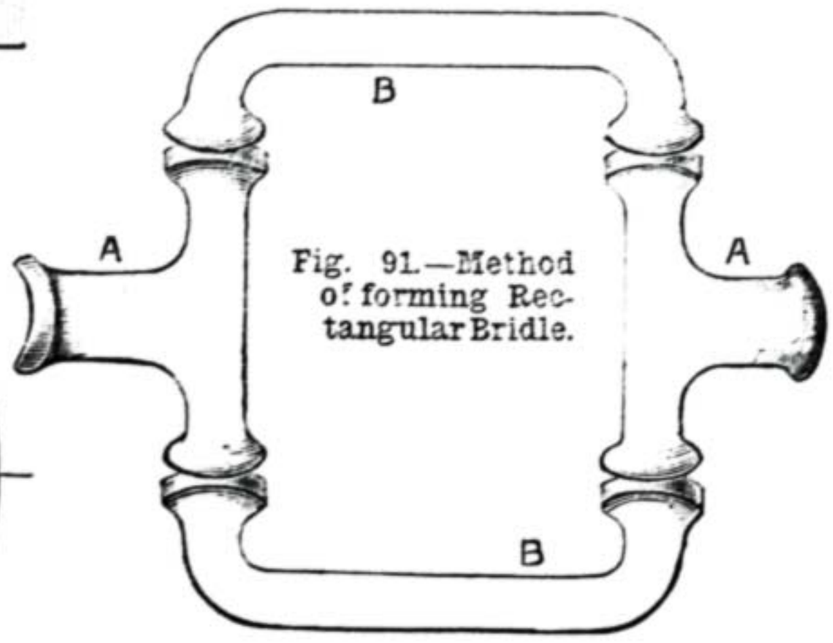


Fig. 91.—Method of forming Rectangular Bridle.

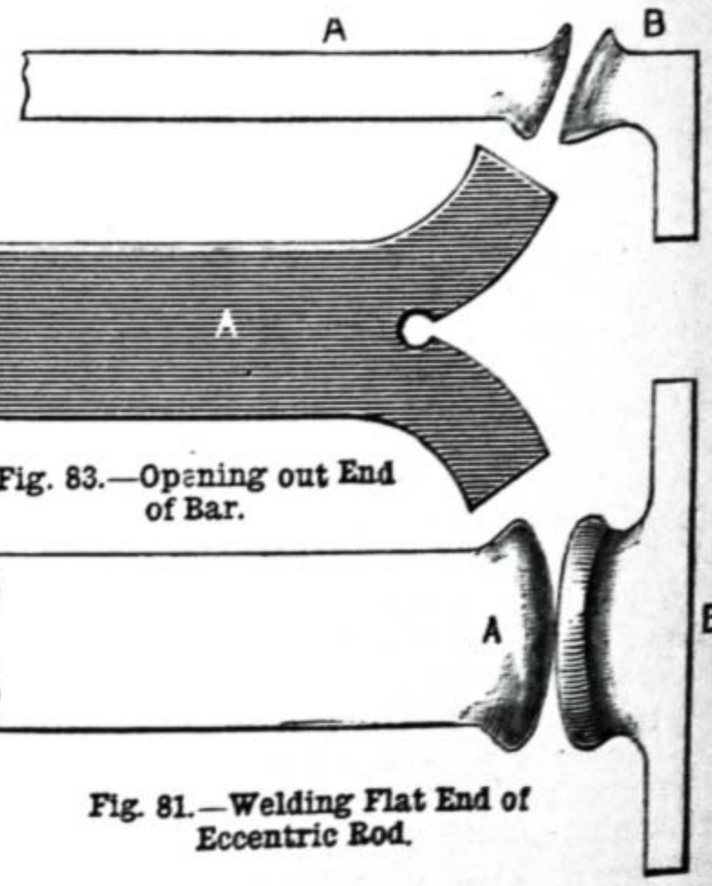


Fig. 83.—Opening out End of Bar.

Fig. 81.—Welding Flat End of Eccentric Rod.

Fig. 82.—Anvil Stop.

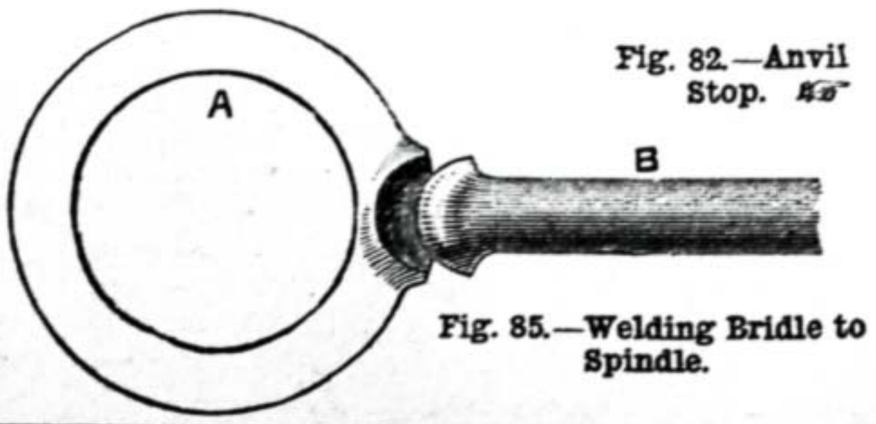
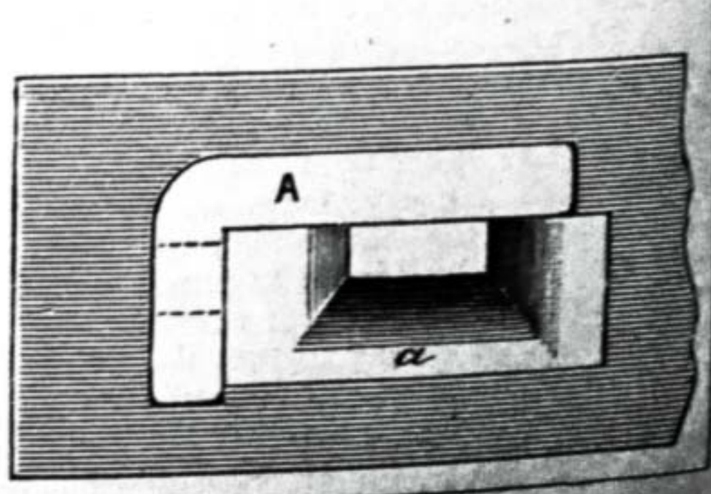


Fig. 85.—Welding Bridle to Spindle.



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rectangular, shape, but the principle of its formation is the same.

Take a bridle of circular form first. By one method the eye would be turned round and welded as a distinct ring, and the stem then welded to the eye; by another method a portion only of the eye would be formed, and welded to another portion made in one with a portion of the stem; by a third method the eye would be turned round of the same metal as that from which the stem is formed, and welded.

Fig. 85 illustrates the first method. Here A is the ring which has been upset and scarfed, turned round on the anvil beak, welded and fullered to receive the upset and fullered stem B, placed in position for welding.

The iron from which the bridle A is made is somewhat larger than the finished section—say, $\frac{1}{8}$ in. each way—and the ring is first turned round to a smaller diameter than the diameter of the ring when finished. The object of this is to allow some finishing work to be done upon the bridle with fullers and flatter, which will have the effect of reducing the area and increasing the diameter. In this way the size of the ring will be increased, and may be easily augmented to any reasonable extent, but it could not be reduced.

The details of finishing the ring and bridle need not be commented on, as they are just like the same kind of work noted in earlier papers. The truth of the ring is guaranteed by slipping it over the anvil beak and correcting its form with the hammer, or over a sugar-loaf-shaped casting (Fig. 86), kept in three or four sizes in well-appointed shops, and flatters, fullers, and swages are employed for finally finishing the various flat and curved surfaces.

When the bridles are large, the bending is best done in the manner shown in Fig. 87, and the same method is likwise applicable to the bending of large rings in general. A cast-iron disc A, of suitable size, and having a central hole, is bolted down on the face of

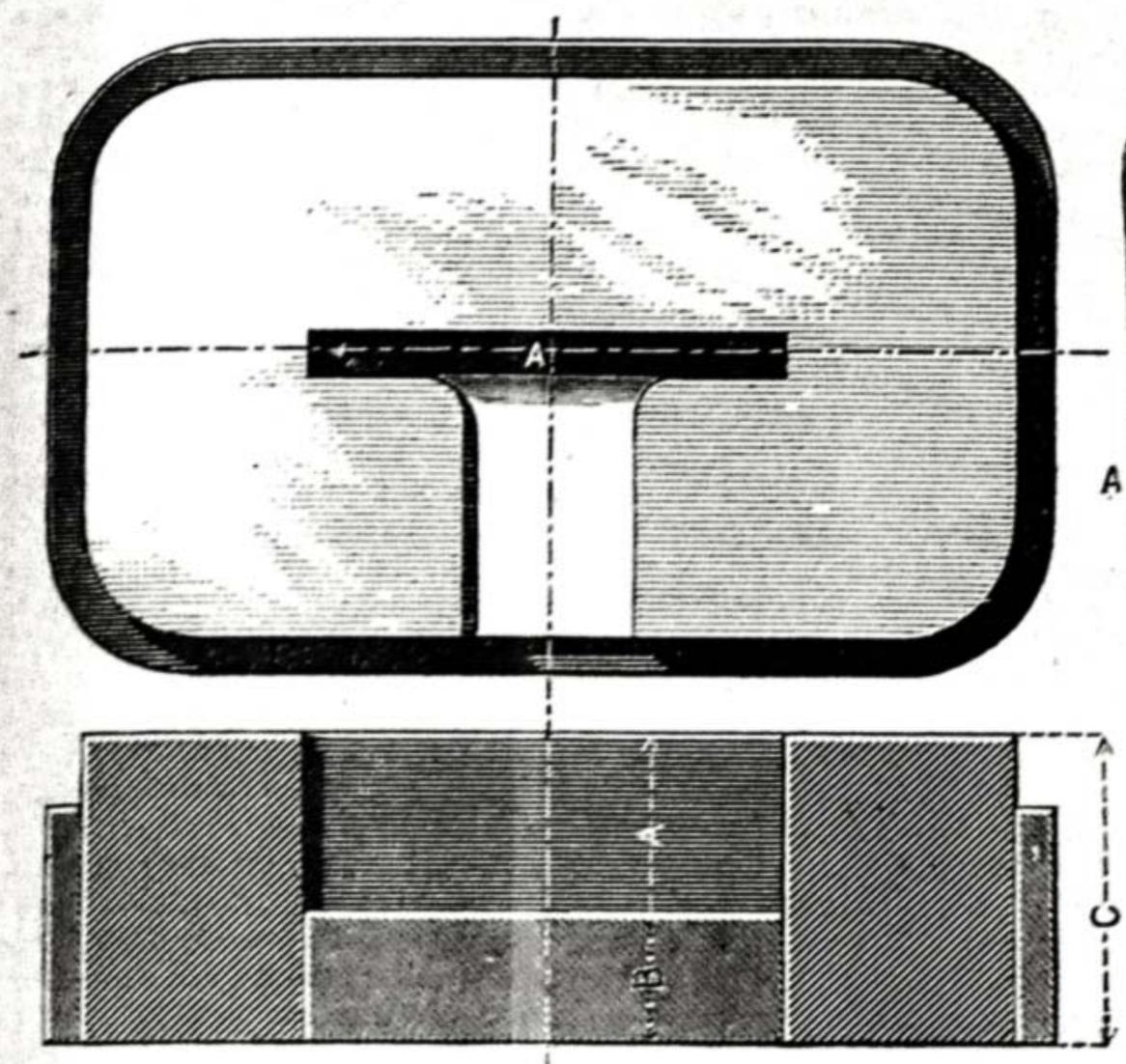


Fig. 84.—Die-block.

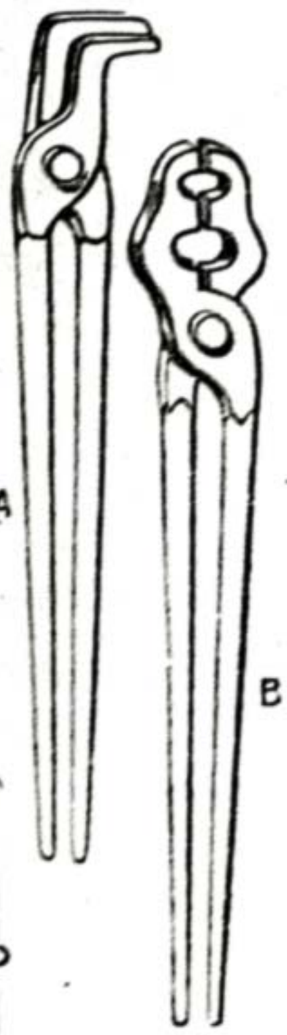


Fig. 92.—Tongs.

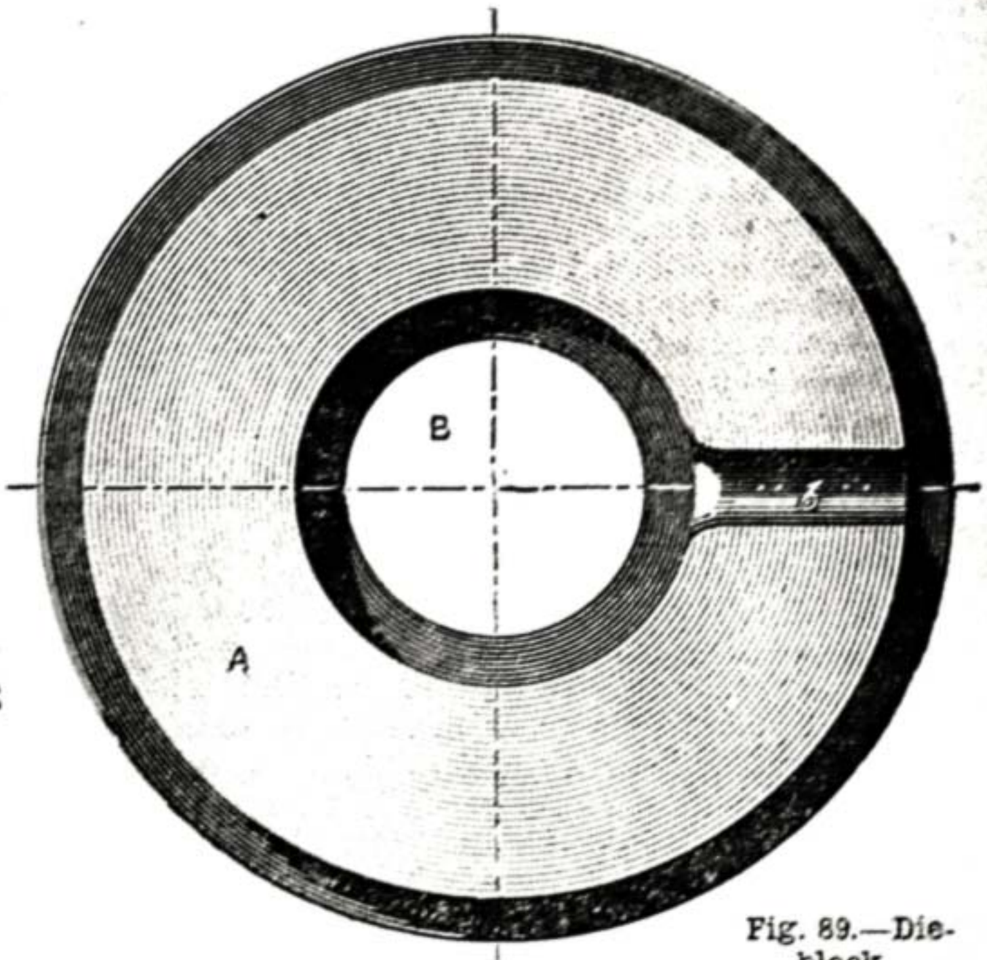
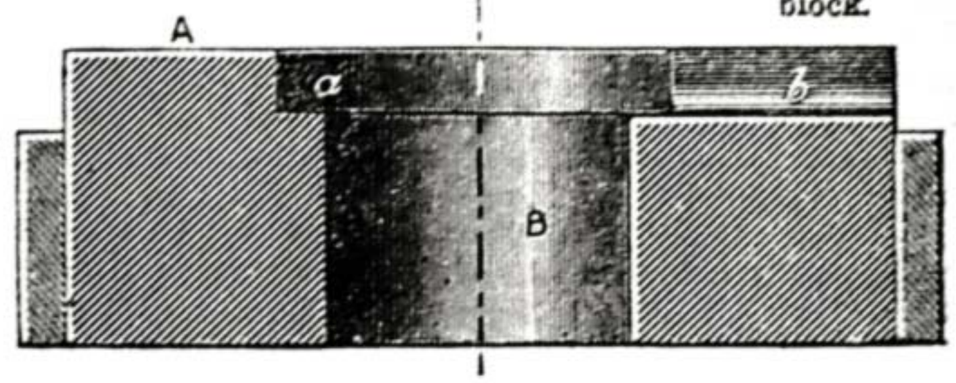


Fig. 89.—Die-block.



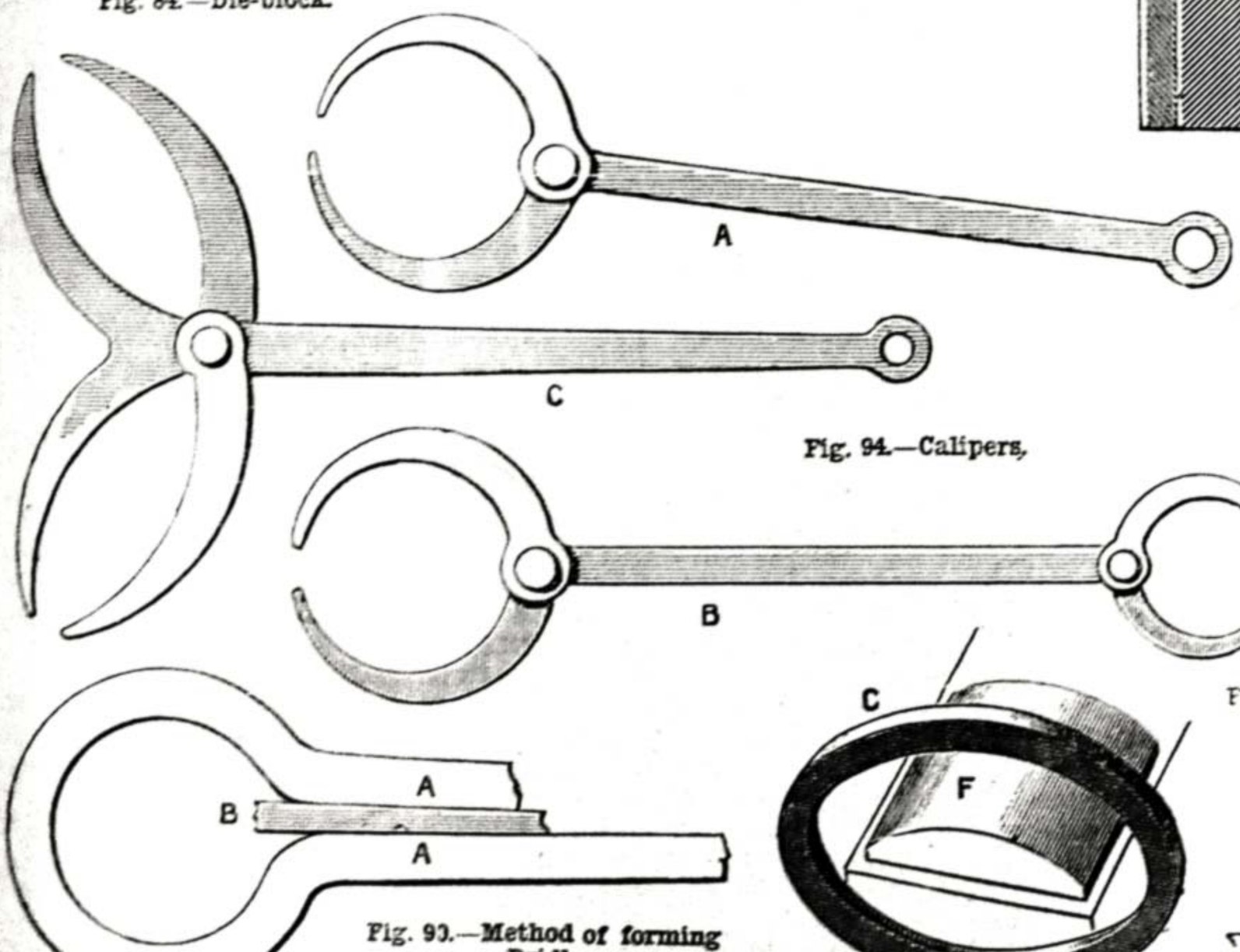
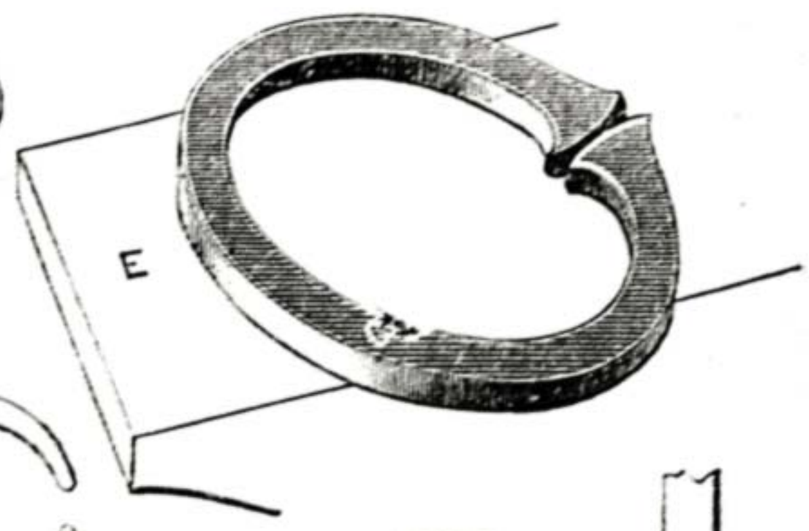


Fig. 94.—Calipers.



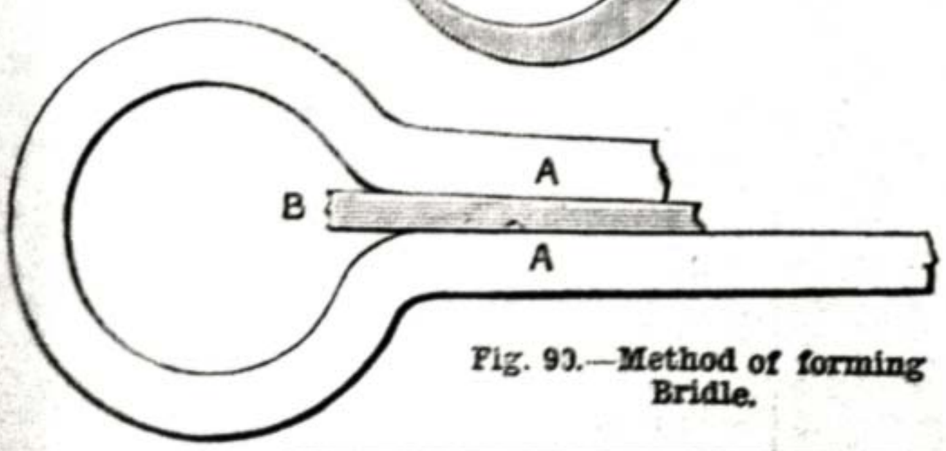


Fig. 90.—Method of forming Bridle.

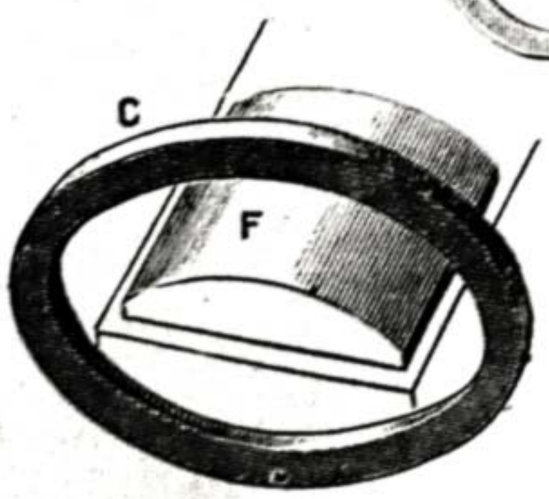


Fig. 87.—Method of making large rings.

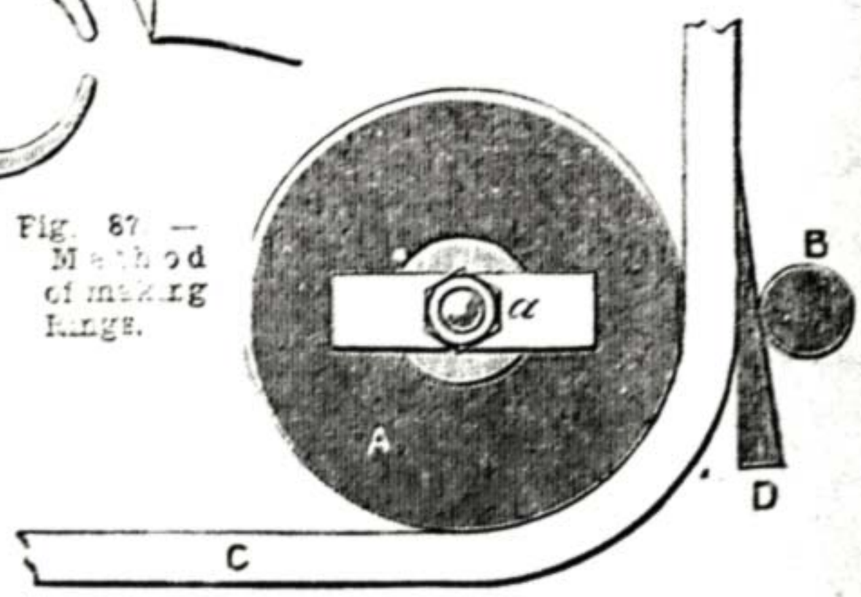


Fig. 93.—Gap Gauge.

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a swage-block, the bolt *a* passing through one of the holes in the block. At a suitable distance a stop or pin B is inserted in another of the holes. The bar C to be bent is, when heated, placed between the disc A and the stop B, and is held securely with an iron wedge D, and the free end is pulled round by hand if sufficient length is allowed, or with tongs if short, and tapped with the hammer the while to cause close bedding of the iron to the disc. When the ends of the intended ring well overlap—say, by an inch or two—it is removed, and the ends are scarfed and upset with hammer or fullering tool, and welded upon the flat face of the anvil E, and finished upon a curved bolster F laid upon the anvil face, or provided with a shank to fit into the square hole in the anvil.

The valve rod bridle may be made alternatively thus. Take a rod of larger section than the valve rod, and fork one end as in Fig. 83, first punching a hole and then driving the hot set inwards, first from one face, then from the face opposite, until the nicks meet in the centre of the bar. Open out the divided ends, bring them into a rudely curved form, and reduce slightly so as to approximate nearly, but not quite, to the finished dimensions, leaving, however, the ends *a* (Fig. 88) of the original dimensions, and fullering them in a diagonal direction for scarfing (A, Fig. 88, showing the T-piece finished for welding). The iron that is to form the remainder of the ring B will be simply curved and fullered, and scarfed at the ends to match the T-piece A.

The diameter of the ring at this stage will, as in the previous example, be less than the finished diameter—say, by $\frac{1}{2}$ in. or thereabouts, dependent on the bulk of the work—to allow of working and finishing subsequent to welding, which inevitably stretches the iron. The spindle will be welded on to the free end *a* with a scarfed joint, or if the spindle is short it may be drawn down from the T-piece itself.

Where these bridles are made in quantity for standard engines a die-block is employed for final finishing. Its shape is that of Fig. 89. A is of cast iron, cored or bored out at *a* for the bridle, and cored out at *b* for the stem to lay in; B is a central steel plug or pin of the size of the hole in the bridle. The bridle is hammered into the die with a couple of blows of the steam-hammer, the die turned upside down on a suitable bolster, and the pin B and the forging struck out at a blow. On the pin being released from the forging the bridle is finished, except for the cutting off the fins around the top edges with a set.

Fig. 90 shows the third method, in which the bar is turned round and welded at A. To preserve the continuity of the circle, a glut or wedge-piece B is inserted in the weld, and forms an integral portion of the forging. Without this it would be difficult, or impossible, to form a perfect internal curve by this method. The finishing of the bridle by means of the tools and of dies differs in no respect from that of the previous example.

In the case of a square bridle, unless of small dimensions, the mode of construction would be that shown in Fig. 91. Two T-pieces A, A are formed by division similarly to the T-piece in Fig. 88, and the remainder of the rectangle is formed of the two pieces B, B, bent round and scarfed to meet the scarfed ends of the T-pieces. The rods may be drawn down from the ends of A, A, or welded on.

For holding and manipulating rings, tongs of the forms shown in Fig. 92, and of various sizes, are employed. Tongs known as hoop tongs are shown at A, and pick-up tongs at B.

When work is being reduced to final dimensions, it is necessary to check dimensions by other means than by that of the steel rule. For flat rods the gap gauge is commonly used. It is of the typical form shown in Fig. 93, each gap being of a definite width to $\frac{1}{8}$ in. or $\frac{1}{16}$ in. Their depth is unimportant, but bears some proportion to width. These gaps, which are really fixed calipers, can be made to embrace and test the dimensions of a red-hot forging in an instant.

For circular work, calipers like those shown in Fig. 94, with long shanks, are used, so that the hand need not become scorched by too close proximity to hot forgings. A is a single caliper; B, C are two forms of double calipers.

FAN MOUNTING.

BY E. CROSSLEY.

UNTIL quite lately, England has depended for many years past on foreign countries for her fans. The French, the Viennese, the Chinese have had the trade in their own hands; and the English, though they have only themselves to thank, have been left entirely out of the field. That this is not as it should be the Fan Makers Company are now doing their best to demonstrate. The exhibitions of home-made fans, of designs for the ornamentation of fan leaves, and of fan sticks, held by the Company, have done much to prove that English workers may in time meet foreigners on equal ground in this important manufacture. So far, we must own, there are very few native artists who can vie with the French in the decoration of the leaf, as our first-class artists do not deign to spend their time on such miniature paintings. The French have done it—Watteau, Boucher, Fragonard, Greuze, in the old time—and why should not the English just now and again execute a masterpiece on the dainty *éventail* that would be handed down for generations as an heirloom to be prized more and more as the years roll on. During the reign of Queen Anne and onwards until far into the eighteenth century, fans were manufactured here in large quantities, then the trade gradually declined, unfortunately for our workers. It will take us years to regain our lost place, though the Fan Makers Company and others are doing their best to stir both men and women up by offering prizes for original designs, and for artistically painted decorations. Even though English girls have copies placed before them which are done by French artists, they find it difficult to reproduce the paintings with equal grace, lightness of touch, and the beautiful harmony of colouring so essential for perfect examples of fan decorations.

It is not my object, however, to dwell on the merits or demerits of fan painters, but rather to describe how the leaf can, when decorated, be mounted on the sticks, and so be made into a fan worthy to be wielded by the fairest of our living belles, and, possibly, by their descendants for many long days to come.

Fan mounting is a pleasant occupation. Many ladies have old favourite fan sticks by them, but, alas! the leaves are worn out, they are frayed at the edges, cut down the folds, the paintings have partially disappeared through constant friction, and they are but useless cumberers of wardrobes. What shall be done with them? If any fan leaf is a masterpiece of art, save it and treasure it in a cabinet, never mind how old or ragged it may be. But there are not many ladies in these enlightened days, when an art education comes to one almost will she nill she, who does not know something of the value of old fans. Those of ordinary merit, when worn out, may well be replaced by new ones. Of course this can be done at shops where fans are sold; but many women who are fond of artistic work may like to paint new fan leaves themselves, and probably would also like to mount them if they but knew how to do it.

I will take one of the simplest fans and describe minutely the mounting of the leaf; then, if anyone follows the directions exactly, the result will be a very presentable piece of work.

Imagine that the gauze leaf is already cut in the shape of a semicircle and painted with a *genre* subject or a spray of flowers. Now about the materials for mounting it.

First there are the fan sticks. The size of the leaf depends on the length of these, which may be 10, 11, or 12 in., or more. If the fan leaf is painted before the sticks are obtained, you must choose sticks of suitable size for it; but the wisest plan is to buy the sticks first, then you are not restricted in your choice on account of the size, and if a particular pattern takes your fancy you are at liberty to have that and no other. There is an immense variety of fan sticks. I was looking over a small portion of the stock of these in a wholesale house a short time back, and was greatly interested in the multiplicity of exquisite designs and the perfect workmanship. The sticks of mother-of-pearl alone were well worthy a long examination. One with the *panaches* wholly undecorated was of mother-of-pearl tinged with blue, like an opalescent lake under a summer sky. Others were smoke coloured, and very handsome they would be when mounted with grey gauze, or white bordered with fine Chantilly lace. Most were of white mother-of-pearl, and the best of these inlaid with silver and gold. A pretty fashion is to arrange all the ornamentation towards one edge of the *panache*, leaving the other plain. There are names for the fan sticks, such as the "Sultan" and the "Shell." Then there were the lovely tortoiseshell sticks, plain, carved and inlaid; the carved ivory and bone, the carved boxwood, and the many cheaper kinds of wood which are ebonised, polished, gilded, to suit the fashions of the hour. But I must not dwell longer on these, though I could willingly do so. Sad to say, these are all of foreign manufacture; the few sticks made here are scarcely worthy the name of fan sticks, so clumsy, so rough are they. The principal number of the foreign ones are made by machinery, but some of the better wooden ones are carved by the peasants of the Black Forest and elsewhere.

A *moule* is indispensable for the fan mounter. We may translate *moule* as mould or model, but that hardly gives a fair idea of the thing. It is a piece of cardboard semicircular in form. It has cuts down it that correspond with the folds of a fan leaf. The cuts do not pierce the cardboard through, but they are deep enough for it to fold up like a fan leaf. In the centre of the top edge there is a piece snipped out to show the middle; this is a guide to the folder. At the edge on one side of the *moule* are short lines, numbered to indicate to the worker where, before commencing to fold, the top edge of the fan leaf should be placed. By this plan the necessity of having different-sized *moules* is obviated. If the

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fan leaf is as large as the *moule*, the top edge is placed just a little above the top edge of the *moule;* if one inch smaller, then it is placed one inch below the top of the *moule*, and so on.

A long pair of cutting-out scissors, a long and very sharp knife, such as is known as a bacon knife by cooks, only more rounded at the top, a quire of tissue paper, a medium-sized iron, good white gum, a sable brush, such as skies are washed in with, about an inch and a half in size, some yards of picot to match the colour of the gauze leaf, sewing silk also to match, and a sheet of white, black, or coloured paper to cover sticks with, as the plain wood does not look well showing through the gauze—these are the requisites of the fan mounter. One other item remains to be mentioned, viz., a square of white marble measuring about 22 in. A square of tin may be substituted for it, provided the latter is firm enough to lay quite flat.

Now, the gauze has been cut out by laying a semicircular piece of thick cardboard upon it and cutting it round the edge of the cardboard, but leaving a slight margin beyond. It has been fixed on a semicircular frame of wood, and the design has been painted, after which it has been left to dry. Next, the mounter takes it in hand.

Laying the quire of tissue paper on a smooth wooden table or on the marble slab, she places the gauze leaf on it face downwards. Then, taking an iron, moderately heated, she passes it lightly over the back of the painting in an upward or downward direction; thus she irons *with* the selvedge, not across it, or in a slanting direction. It is more like laying the iron on the gauze than ironing in the usual manner. The warmth from the iron *brings up* the painting and gives it value.

The first fold is made with the hands. This is not right down the centre of the leaf as would generally be supposed, but takes a slightly slanting direction; this leaves a piece of the gauze single, whilst all the rest is double; the single piece will form the lining of one of the *panaches*. The single portion is about 2 in. wide at the top, or rather less, and comes to a point at the bottom. Let anyone take a half-circle of paper, and fold it as I have described, and they will see at once what I mean. Whilst the leaf is still only folded this once a small half-circle is cut from the bottom of it; this will be cut again later on, so sufficient margin must be left to allow for that.

A piece of thin white paper, not tissue, is cut the same shape as the leaf, though it may be a trifle larger with advantage; it is folded once just like the leaf. This is put outside the mount to keep the latter clean. The *moule* is taken up in the left hand and held just below the centre snip, and between finger and thumb. The leaf, covered with the paper, is slipped into the *moule*, the centre fold of the leaf being brought into the centre one of the *moule*. Doubled as it is, the mounter lays it on the marble slab. She keeps the centre fold tightly pressed with the left hand, whilst she makes the gauze and paper lay flat inside the *moule*. Now comes the need of dexterity. She must never let go the centre fold until the first half is folded. She sets it straight longwise in front of her, and draws up with her fingers the other folds until they are level with the centre one. This is done by keeping the thumbs on the outer side of the middle fold, and with the fingers of both hands drawing up the half of the *moule* that lays beyond on the marble slab. When the half is done, and still held tightly, the other half is tossed over so that it, in turn, lays on the slab; it is treated exactly in the same way, and now all the *moule* is folded. This is pressed tightly between thumbs and fingers, which are passed up and down the *moule*, which still rests on the slab; the folds are patted along the top to keep them level, as everyone must be perfectly even. When this is finished, the first end fold of the *moule* is turned back, and the edge of the gauze leaf is neatly trimmed off with the large scissors, only just enough being left to cover the inside of the *panache*. Then the edge of the other outer fold is cut in similar fashion. The *moule* is again closed, and the bottom of it is held tightly down on the slab, whilst with one stroke of the big, sharp knife the bottom edge of the fan leaf which projects a little below the *moule* is cut off.

The leaf is now taken from the *moule*, and to keep it in folds a narrow piece of paper, which has been previously gummed so as to form a ring, is slipped over it. The mounter gets her needle and silk and the picot. Then she takes off the paper ring and proceeds to sew on the picot. Long stitches at the back of the gauze do not signify down the sides, as they will be gummed down to the *panaches*, but along the bottom edge the work must be rather neater. Still, the less the mount is handled the better. Any good worker will see at once that the only difficulty is in putting on the picot around the lower edge of the fan leaf, and at the top. The gauze being cut in half-circular form, the material *pulls*, as the saying goes, more in one part than another. The great point is not to stretch it, and not to draw it in; the only way to manage this is to keep it as flat as possible on the tips of the fingers of the left hand whilst working.

If the sticks are cheap wooden ones (and I suppose none would make a first attempt on the better kinds, such as carved ivory or tortoiseshell, and perhaps not on carved bone), it is necessary to scrape them to make them smooth, and then to cover them with thin white, black, or coloured paper to match the tint of the gauze leaf. This, it goes without saying, it is wisest to do before the fan mounting is commenced, as the gum must be allowed time to dry or the paper would tear off at a touch. The sticks are now taken in the left hand, the sable brush mentioned amongst the requisites is dipped in gum, and the paper that covers the sticks (or the sticks themselves if they are uncovered) are brushed over on one side only. This has to be done carefully; if too much gum is used it would run to the other side of the stick, and so spoil the leaf; at the same time every portion of the sticks, on the one side, must be gummed, else the leaf will not adhere properly. The insides of the *panaches* are also gummed. On no account must the sticks be folded together at this juncture. Now comes the test whether the fan mounter is an adept in the art. The fan leaf is folded and taken in the left hand, the sticks are held in the right. One by one the sticks (just the tips of them) are laid between each fold of the leaf. We have nothing to do with the *panaches* at this moment—they are left loose. The sticks are laid about an inch up on the bottom edge of the folds. Now the leaf and sticks are tightly folded, and the bottom end of the sticks is rested against the worker's chest whilst she gently draws the leaf down the sticks until the picot just reaches the shoulders. The skill is shown in doing this so that all the folds are drawn down the sticks equally at once, and as a result the picot being perfectly level on the shoulders of the sticks. To do this the edges of the sticks and folds must face the worker; she holds the folds of the leaf at the bottom edge only between the thumbs and two first and second fingers of each hand, and gently draws it down. The fan is again taken in the left hand, and one *panache* is turned up and laid on the outer fold. This has to be done with great nicety too, as just the extreme edge of the picot ought to show beyond the edge of the *panache*. It is the careful, or the want of careful, attention to all these little details which makes the difference between a good and an indifferent fan mounter. The second *panache* is fixed, and then the worker takes a strip of gauze, or a piece of ribbon, or tape, or anything that lies handy about, and ties round the top of the fan leaf, and then the bottom. After which she leaves it for awhile until the gum is dry; a few minutes will suffice for this.

The needle and silk are in requisition again to fasten the picot on the top of the fan leaf. It is rather awkward to do, as the sticks are in the way, but practice soon teaches how it may be done with the least trouble. The tip of each stick is caught in with the stitches to make them so firmly fixed to the leaf that the two cannot part company. After the picot is on, the tip of the leaf needs a touch of gum to refix it to the *panache;* it will have been unloosened to sew on the picot.

The fan is then opened and examined; if there are any gum spots detected, they are removed by damping them with the tongue slightly. The mounter then lays it aside as finished.

The single gauze leaf is one of the easiest to mount. Having learnt how to do it skilfully, the mounter will be able, by examining the double gauze fan leaves, to mount them also; to introduce lace as medallions, to border with lace, to mount the "Shell" fan and the "Sultan"—all will come easy after once the knack is acquired. Dexterity, cleanliness in working, patience in overcoming difficulties at the outset, steady perseverance, and great nattiness—these are some of the needful qualities of the clever fan mounter. Girls are apprenticed for four years to the trade; this alone shows that there is something more to be learnt in it than can be done in a day. To any girl of average intelligence who is clever with her fingers, and dainty in her ways of handling materials, fan mounting offers fairly lucrative employment. It needs no special talent, but quickness in working and industry tell here; and a girl who makes up her mind to do so, will soon excel.

FITTING AN ELLIPTIC CHUCK.

BY JAMES LUKIN.

Revolving Nose-piece—Division Wheel.

The addition of a revolving nose-piece, with its division plate and ratchet wheel, or its worm wheel and tangent screw, offers many advantages. Without this the ellipses of a surface pattern must lie upon the same diameter, being merely a series of elliptic rings within each other, with their longest diameters in the same direction. The simpler chuck is therefore chiefly of use for small picture-frames and such like articles, and for plain elliptical boxes; but a series of interlacing rings can be cut round them

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by the usual eccentric cutter, using the division plate or the mandrel to space them properly; and simple mouldings of elliptic form can also be easily cut by suitable hard wood or slide-rest tools. But if an ellipse chuck has its own division plate, the figures can be cut on any diameter, so as to range in a star-like form round a common centre. This, of course, opens up a possibility of an infinitely varied series of patterns, both superficial and perforated, as well as a power of carving designs on the solid by using fixed and revolving tools. It is consequently well worth while to expend such extra labour as will produce a chuck capable of these extended uses; and as it only needs a very easily made addition, I will at once describe it in detail. Fig. 11 shows the

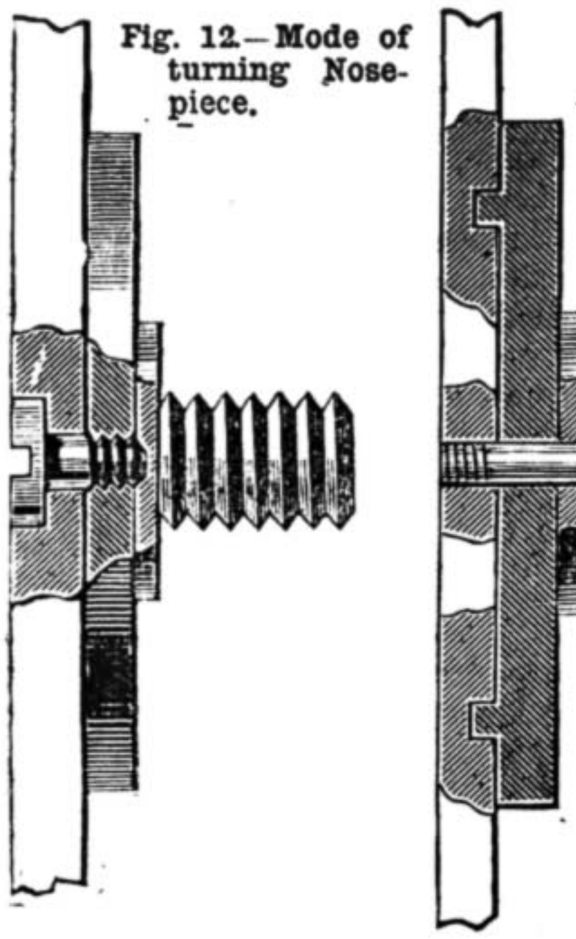


Fig. 12.—Mode of turning Nose-piece.

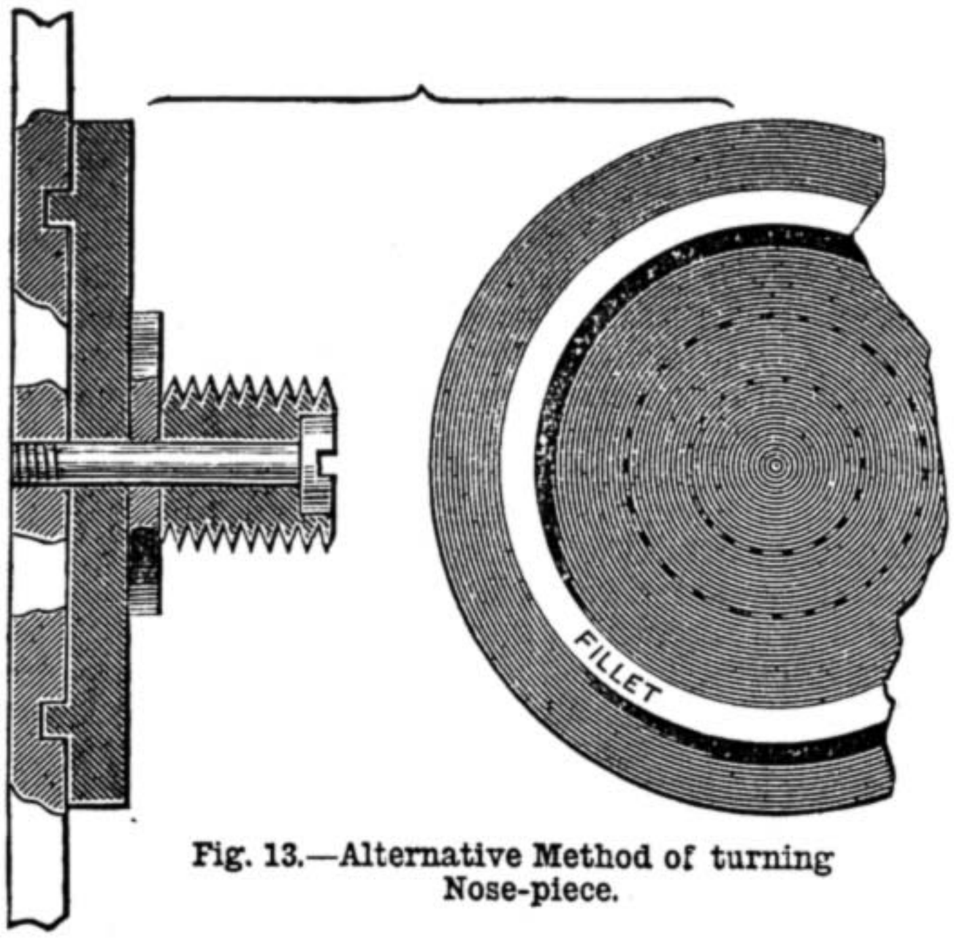


Fig. 13.—Alternative Method of turning Nose-piece.

division plate and its nose-piece to turn easily with its screw, which latter should be a somewhat tight fit. It cannot, however, become unscrewed by the movement of the division plate, as the base plate of the chuck prevents it. Fig. 12 shows this method, Fig. 13 the other; and here is also shown a turned fillet, fitting a circular groove worked in the sliding plate, by which, in all such cases, stability and freedom from shake are obtained. Some makers sink a portion of the division wheel itself, turning it down at the under side, like Fig. 14. This is scarcely so good a plan as the fillet, but easier to fit. There is no need to describe in detail the process of turning and fitting these parts. It can be very easily done, even by hand tools; and if the pieces are securely chucked, however, a hundred divisions, marked in figures at every fifth, and the tangent screw is of ten threads to the inch. Its diameter, to take a hundred teeth, or rather a hundred recesses, is 3·18 in., as given in Mr. Evans' book on ornamental turning. My own before cutting was, I observe, exactly 3 in. diameter; but I would rather trust to Mr. Evans' statement. If it is decided to have a worm wheel and screw cut, instead of a click plate, a short bit of screw, say 2 in., should be ordered at the same time, the ends of which can be subsequently reduced to plain cylinders, and one such end squared for a key or winch handle. There is no real difficulty in fitting up this part, which should not have its bearings screwed to the sliding plate, but turning on a pin, and

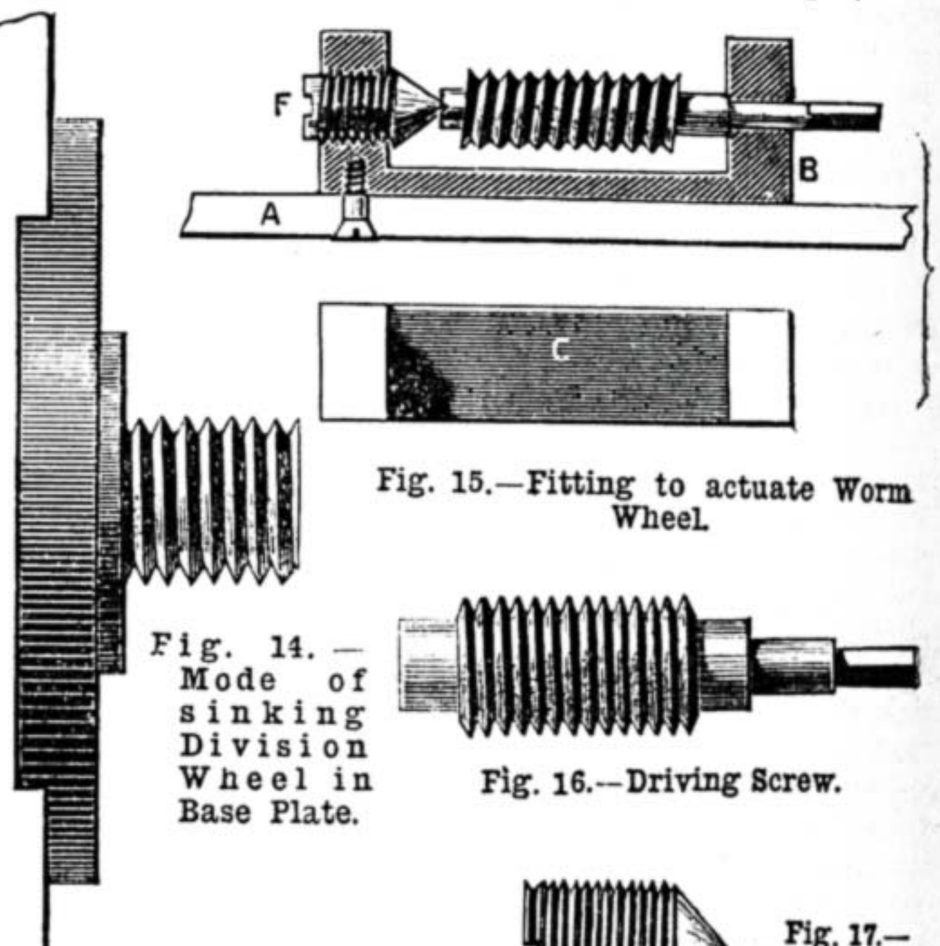


Fig. 15.—Fitting to actuate Worm Wheel.

Fig. 14.—Mode of sinking Division Wheel in Base Plate.

Fig. 16.—Driving Screw.

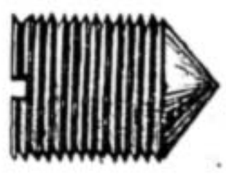


Fig. 17.—Centre Screw.

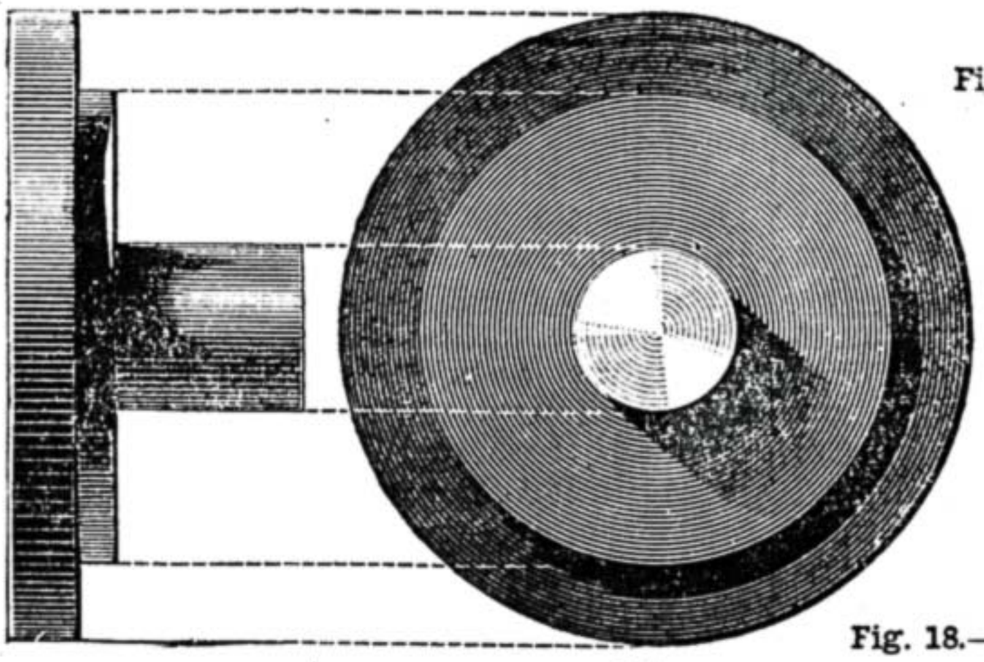


Fig. 11.—Casting of Loose Nozzle.

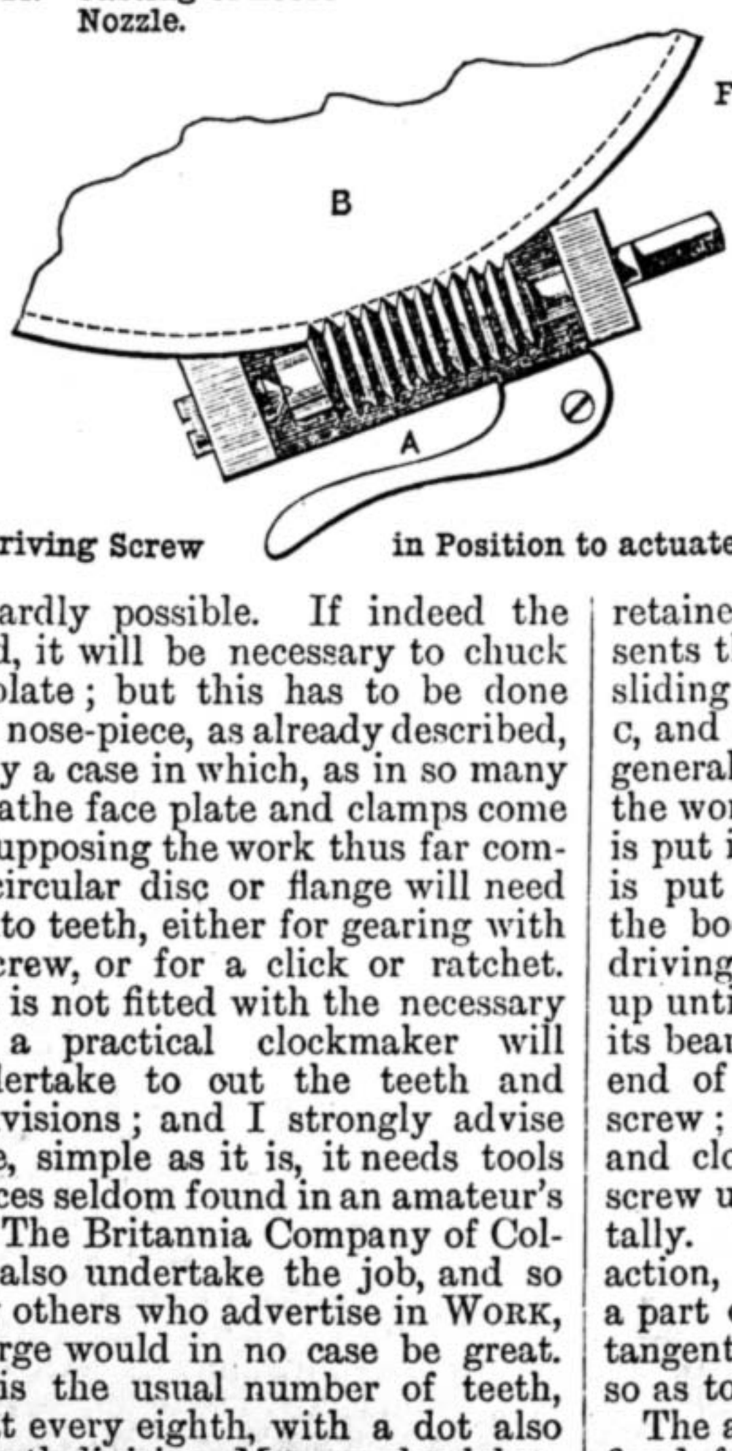
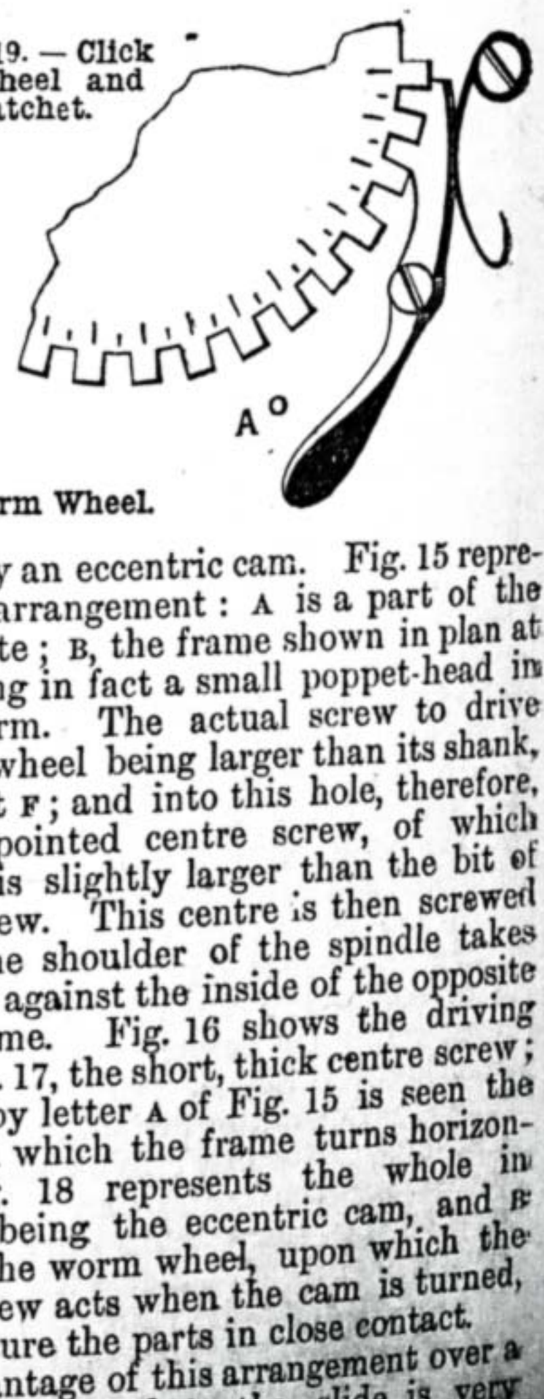


Fig. 18.—Driving Screw in Position to actuate Worm Wheel.

Fig. 19.—Click Wheel and Ratchet.



loose nozzle as a mere casting. It is exactly similar in form to that of an eccentric chuck, being a round plate of brass or gun-metal, with a cylindrical projection in the centre, which is to form the screw on which to mount ordinary chucks carrying the work to be turned. There is no difficulty about turning this part, as the nose gives such facility for mounting it in the lathe, in order to turn the base level and circular; and when this is finished, it only needs to be seized by the base in a grip or wood chuck, in order to turn and thread the cylindrical part; but during this process a hole has to be drilled quite through the centre, and enlarged to receive a good-sized pin of steel, upon which it will turn when in actual use. This is not, however, always so mounted. A screw is sometimes put in from the back, the head of which is recessed into the back of the slide. The screw shank is left cylindrical for a distance below its head, equal to the thickness of the plate, to allow the failure is hardly possible. If indeed the fillet is used, it will be necessary to chuck the sliding plate; but this has to be done with a solid nose-piece, as already described, and it is only a case in which, as in so many others, the lathe face plate and clamps come into use. Supposing the work thus far completed, the circular disc or flange will need to be cut into teeth, either for gearing with a tangent screw, or for a click or ratchet. If the lathe is not fitted with the necessary apparatus, a practical clockmaker will readily undertake to cut the teeth and mark the divisions; and I strongly advise this, because, simple as it is, it needs tools and appliances seldom found in an amateur's workshop. The Britannia Company of Colchester will also undertake the job, and so would many others who advertise in WORK, and the charge would in no case be great. Ninety-six is the usual number of teeth, numbered at every eighth, with a dot also over each fourth division. My own chuck has, retained by an eccentric cam. Fig. 15 represents this arrangement: A is a part of the sliding plate; B, the frame shown in plan at C, and being in fact a small poppet-head in general form. The actual screw to drive the worm wheel being larger than its shank, is put in at F; and into this hole, therefore, is put a pointed centre screw, of which the body is slightly larger than the bit of driving screw. This centre is then screwed up until the shoulder of the spindle takes its bearing against the inside of the opposite end of frame. Fig. 16 shows the driving screw; Fig. 17, the short, thick centre screw; and close by letter A of Fig. 15 is seen the screw upon which the frame turns horizontally. Fig. 18 represents the whole in action, A being the eccentric cam, and a part of the worm wheel, upon which the tangent screw acts when the cam is turned, so as to secure the parts in close contact.

The advantage of this arrangement over a fixed frame screwed to the slide is very

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great, as the divided wheel can be turned by the fingers on releasing the cam; and even with a winch handle this is a tedious operation when many divisions have to be passed over, as in dividing the circumference of the work in hand into two, three, or four parts only, as will often be necessary. An inspection of Fig. 18 will show that part of the frame carrying the tangent screw will project beyond it. This can be avoided by allowing it to go under the worm wheel by turning the latter with a shallow rebate, as dotted. It need not be so wide as here drawn; but being only attached at one end, the broader its base can be made the better, as it will be less liable to work loose. The click wheel and ratchet, of which a segment is shown in Fig. 19, is too simple to need much explanation. If a hole is drilled at A, and a pin fitted in such a position as to retain the ratchet when pressed down far enough to free the divided wheel, the latter may be adjusted by hand, which is sometimes convenient at the commencement of work, when the pressure of the spring is inconvenient, and both hands are temporarily needed. This will, of course, not be needed at any other time.

A NEWSPAPER OR MUSIC EASEL.

BY S. F.

IN these days of cheap literature, when people "take in" so many weekly and daily pennyworths, and the more substantial monthly magazines, it often becomes a matter of importance to our friends of the gentler sex to make them look a bit tidy. They accumulate daily and are not always read regularly, and so cannot be assigned to limbo all at once; besides, there are often things in them to be referred to at no distant date. For instance, you cannot get through WORK so very quickly, particularly when you have only an hour or so at your disposal every day for reading; and then there are hosts of other papers that have to be at least run over, and these facts make it imperative that they shall be at hand at any moment within the current week, at all events.

To meet the demand for a tidy, the article I am about to describe is of the best. Light, easily made, portable, and, above all, ornamental, it forms a very pretty addition to any drawing-room. It is equally available for all sorts of papers, music blotters, and let me gain the ladies' ear, fashion plates.

To make the easel, we require but a very small outlay indeed: a couple of shillings for wood, a shilling for enamel paint, and another for hinges, is about all that is required. The wood used is supposed to be white or yellow pine, and then painted, but, of course, any wood may be used. The wood required is of the following sizes:—For the two side pieces, 4 ft. 5 in. long by 1⅛ in. square, when planed; for the laths, 3 ft. 10 in. long by ¾ in. or ⅝ in. wide, and ⅜ in. thick; for the joining bars, stuff of 1½ in. by ⅝ in. thick, and of the sizes and shapes in the sketches. For the pieces to which the frames are screwed, we require pieces of the various lengths and 1⅛ in. square. One edge is then to be planed off till they are 1⅛ in. on the top edge and ½ in. on the lower edge. These cross-bars are screwed on from the back through the side pieces, and the frames are fastened to them by two hinges. The frames are made double, Oxford pattern, as shown in the drawings; the wood is ⅝ in. square when planed; the ends projecting are 1 in., and the spaces are ⅝ in. each; the pieces are halved into each other and glued into place. The frames are not all the same size: the top one is smaller each way by 1½ in., and the bottom one is larger each way by 1½ in. than the middle one, but the pieces are all of the same scantling. The strut is 3 ft. 10 in. long by 1½ in. by ⅝ in. thick, and is morticed into a top piece of the same scantling 7 in. long. This takes two hinges, which are also fixed to the top joining bar, and a cord keeps the strut from spreading too far. Lastly, come the two little turned knobs for the tops of the sides, which, if you have not got a lathe, may be bought for 3d. or 4d. The whole affair cost me 3s. 6d., made up as follows:—Wood, 1s. 4d.; paint, 1s.; hinges, 1s.; screws, 2d. Total, 3s. 6d. This ought to be cheap enough to satisfy everybody. Of course, it may be made larger and heavier, or smaller, if required, but I think the sizes I give are about the most convenient, as the one I have made looks remarkably well.

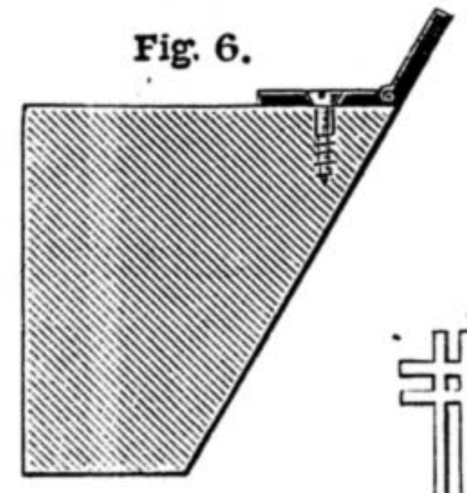

Fig. 6.

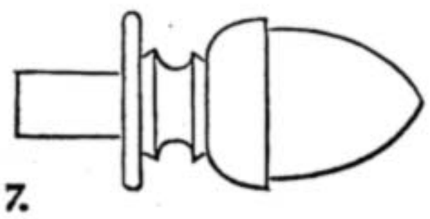

Fig. 7.

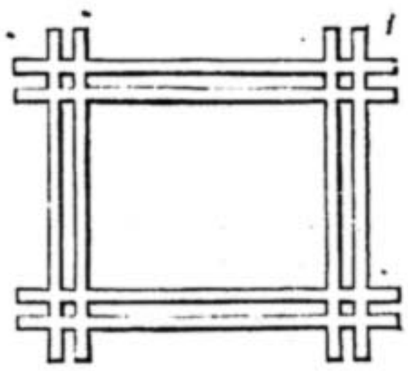

Fig. 5.

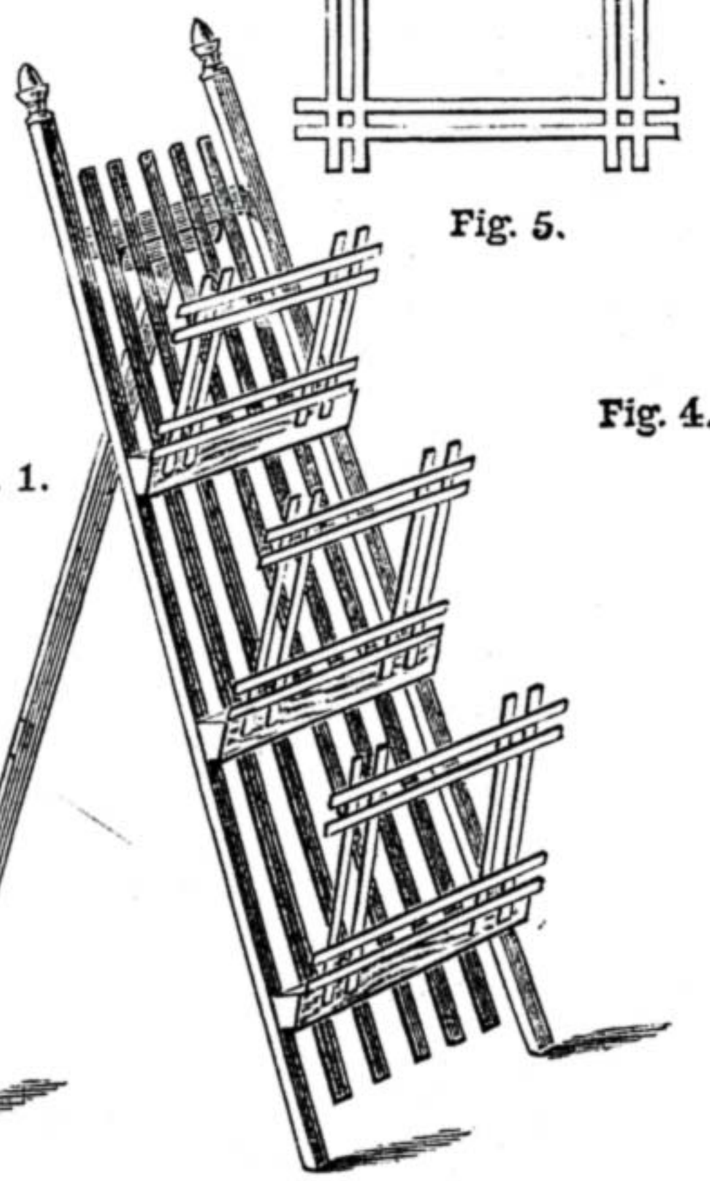

Fig. 1.

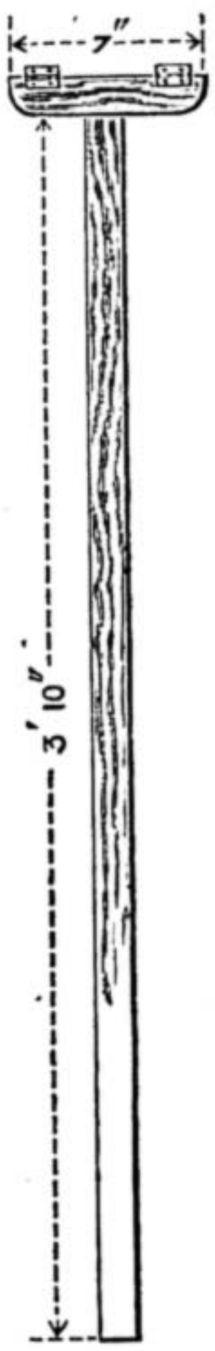

Fig. 4.

Fig. 3.

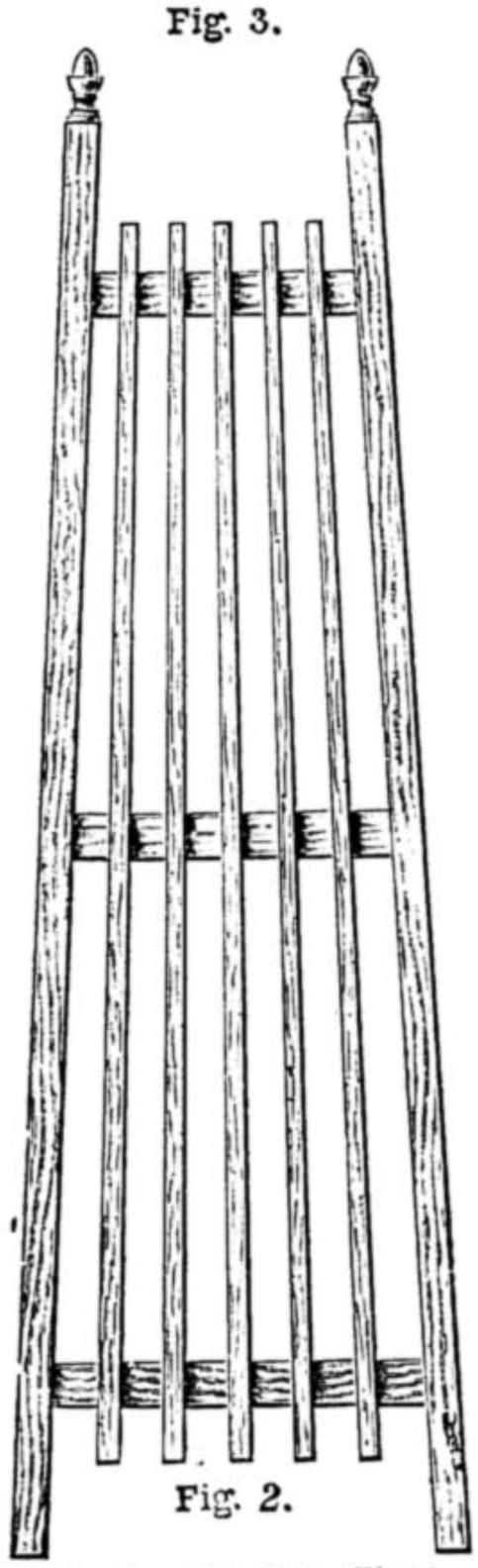

Fig. 2.

Fig. 1.—Perspective Sketch, not to Scale. Fig. 2.—Framework. Fig. 3.—Section of Laths. Fig. 4.—Strut, ⅝ in. thick. Fig. 5.—Middle Frame. Fig. 6.—End of Frame Support (full size). Fig. 7.—Finial (half size). Figs. 2, 3, 4, and 5 are drawn to ¼ scale.

MEANS, MODES, AND METHODS.

A FEW MORE HINTS FOR WORKING WITH THE GRAPH.

I DO not recollect having seen the one or two tips I am going to give mentioned by previous contributors in their hints upon the graph composition so extensively used at present for copying letters, music, and drawings; and therefore it may happen that, humble as they are, they may prove serviceable to some. The use I make of this method of printing is very considerable, and consequently my remarks have personal experience for their foundation. Of all the modes of printing, whether large or small, I should say that the one in question is the most productive of tantalising labour and impatience. Others besides myself must have felt annoyance during the warm weather at the manner in which the graph became sticky, and *would* come away with the paper, which was supposed to receive no further impression than that for which the ink was used. I find that in such crises a useful thing to do is to fill a flat dish of some sort with cold water, placing the graph tin in the water, and allowing the latter to reach nearly to the top of the tin. I notice that it is an almost invariable rule with most users of this composition to rub and scrub away at the surface of this stuff after they have finished printing. Now, in my humble opinion, this is detrimental for more than one reason. By these means a comparatively rough surface must be the result, and a consequent waste of the material must take place. The way I proceed is different to this. I first give the stuff a slight rinsing to wash off dirt, etc., and then cut it out of the tin, and place it in a can preparatory to being put into a saucepanful of hot water already prepared to receive it. I let it melt in the same way as glue is treated, and give it a thorough good stirring. When it is in a condition to flow freely I pour it back into the tin and put a board over it to keep off dust, etc., and allow, according to the state of the

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weather, four or six hours to elapse before again using it. By these means a clean, smooth surface is obtained, and I find that by allowing the ink to thus mix with the composition the latter is improved. Of course, everything wears out in course of time, and this stuff will become leathery; but by occasionally adding a drop or two of water and glycerine whilst the stuff is in a melted condition, great improvements are effected, and I think it is a less expensive way than rubbing the impression off.

I have heard it advised that to use very *smooth* paper for drawing or writing upon with the ink is best, but experience has told me that paper more of the texture of that with which WORK is fed is preferable. I am not a chemist, and therefore cannot explain satisfactorily what I should like to be able to; but there is some ingredient in the ink which the rougher paper absorbs, allowing but the vital property of the ink to adhere to the composition. On smooth paper, I think that this "something" must be the cause of the lines sometimes smearing.

I find that some papers I use, upon which the original may be, after being pulled from the graph, leaves a lot of fluff on the latter which in no way improves the quality of the copies. Until lately I hesitated to adopt what I thought would be the best way to proceed in such a case, but I finally experimented, and can give it as a useful hint that when such instances arise, if a damp sponge is firmly but carefully run along from one end to the other of the graph (the impression, of course, being upon the latter) with a from side-to-side movement, going over the surface but once, the fluff is taken off, and instead of the ink being smeared, an improvement is added to it.

I have never made any of this graph composition, as I believe the cheaper and best way is to obtain it from makers who have thoroughly learnt to manufacture it. The firm from where I obtain that which I use manufacture exclusively this class of goods, and I have always been satisfied with their wares. Should any readers be desirous of knowing where this place is situated, with the wish to purchase material with which to copy fretwork designs, etc., I shall be very glad to give them the information, if the Editor will permit me to do so.—J. S.

HOW TO AVOID WET FEET.

Now that the winter and rainy season are busied in treating us to their various inconveniences, it may not be unadvisable to give a means of making boots waterproof against the ordinary rains or snows. Of course, a well-made boot which has not been in use very long is, or should be, proof against ordinary wet for a considerable time, but, unfortunately, not all boots are well made (I was almost going to say all boots are not well made), and many of us have boots which have been in use for several months.

What I do with my own boots, and advise others to do with theirs, is this:—Firstly, I see that the boots are in good repair; as I sole my own, I never let the sole get too thin. This in itself is a great aid to keeping one's feet dry, for if the boot sole is worn through, or as thin as blotting-paper, wet is bound to find its way in somehow or other. Secondly, when I am going out in a regular downpour of cats and dogs, I warm the soles and the boots generally, and rub in with a stiff brush—an old tooth-brush is excellent for the purpose—as much neat's-foot oil as the leather will take in; and in very bad weather, or in snow time, I rub over the uppers as well. This oiling process is no hindrance at all to the subsequent daily re-polishing of the boots; in fact, they polish better after it.

For anyone engaged in farm work, country work, policemen, watchmen, and others, I would advise that two or three ounces of oil, either neat's-foot or horse oil, be put inside each boot, and the boots placed near a fire till the oil has oozed through. The boots then, if in good condition, will be as proof against wet as it is possible to make them. The smell of the oil is a trifle unpleasant, but I prefer it to wet or damp feet.

It is not everybody who can afford waterproof over-boots or shoes, or even the old-fashioned and much ridiculed goloshes; I don't recommend anyone to wear them as a rule, as a tight-fitting, impervious covering to the feet makes them tired much sooner than usual.

My summer holidays are often spent botanising or geologising in Devonshire. I should not dream of starting from home without my little flask of neat's-foot oil. I persuaded the ladies of my family to try the oil on their boots, and in bad weather they often ask where I keep my oil, and, if they think I am oiling my own boots, they bring theirs to be done at the same time.

Any animal oil would, I think, answer the purpose, and sperm or horse oil, though I have not tried them.

When I was a boy, I remember having my boots rubbed with mutton fat, and I can recall the ridicule I underwent for entering school with well-besmeared boots—but those that win may laugh, and so may those that have dry feet.—H. J. L. J. M.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

103.—CLOG IRON REPAIRING.

MR. HOLLINGWORTH, 136, Balfour Street, Oldham, sends me a specimen card of his "Clog Iron Repairers," and wishes me to mention them for the information and benefit of all who wear clogs in the manufacturing districts. There are eight irons, four large and four small, on the card, which is sold for 2d. As Mr. Hollingworth sent me a clog to look at, the first of this kind of footgear that I have ever seen, I may say that they appear to me to be cheap and well adapted for the purpose they are intended to serve. The irons are spiked at the back for driving into the wooden clog. He claims for them that any person can fix them, the best way to do so being by laying a piece of iron on the repairer and driving home with a hammer, and that, having no nail heads to wear off, the repairers will maintain their position on the clog sole until worn through. Further, that when the sole irons are worn very thin, by putting these repairers on the clog sole, it will have as good effect as re-ironing, and that when any part of the heel is worn away, it can be replaced by using the heel repairers, without pulling the other portion of iron off.

104.—GREENALL'S STEAM WASHER.

Everybody who runs a laundry and who is interested in washing day should send for and read "The Greenall System of Washing Clothes," sent out by Mr. John Greenall, 120, Portland Street, Manchester. Of the two systems, the cold water one chiefly followed by the French laundresses, and the hot water one, the latter is obviously the most expeditious and economical, and Mr. Greenall's system seems to

Fig. 1.—The "Petrel" Stove.

be the most expeditious and economical of the many modes of washing under this plan. Of its merits the readers of WORK may judge by the following description and accompanying illustration of the machine (Fig. 2). It is somewhat like a large knife-cleaning machine, 45 in. high, on a frame about the size of the frame of a sewing machine. The box that forms the casing of the washing apparatus is of bright copper, with a handle for turning by hand an inner specially formed cylinder that holds the clothes. Beneath

Fig. 2.—Steam Washer heated by Stove.

it is a stove for coal, gas, or liquid fuel. Whichever form of combustion may be desired may be used, optionally, from gas or any stove-range, or from a cooking stove range, as the "Petrel," which serves both purposes, and to a certain extent both operations may be carried on at once by this handy stove. Fig. 1 is a view of it. With this washer, the handle turning is the mechanical operation; the cleansing within the cylinder is by the aid of steam made to reciprocate all these movements of a handle. In the copper case or box is another, the actual revolving cylinder in which the clothes are put having been previously soaked well in cold water. In

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the stationary case, about three inches of water only is necessary, on the principle that the less the amount of water, the more room for steam and for steam *beating*, for this rightly is the *modus operandi* of extracting the dirt from the clothes after it has been converted into liquid mud. The revolving cylinder, as partially shown by Fig. 2, has its inner periphery formed of ridges which beat the mud out of the clothes under the expansive force of steam, rinsing them and disinfecting them at the same time. The two small sizes of the machine will cleanse a double blanket or eight shirts, or a collection of collars, cuffs, handkerchiefs, and lace of a family in ten minutes or a quarter of an hour. Larger sizes take a greater bulk of things, but no longer time, so that what used to be called a day's wash is now the fraction of an hour. The wringing, blueing, mangling, etc., made easy by similar simple machines made and sent out by Mr. Greenall, should be welcomed by families as an addition to their comfort, whether small or large. £3 3s. is the price of Steam Washer on stand for gas heating. This costs ½d. per hour for 16 feet. THE EDITOR.

SHOP:

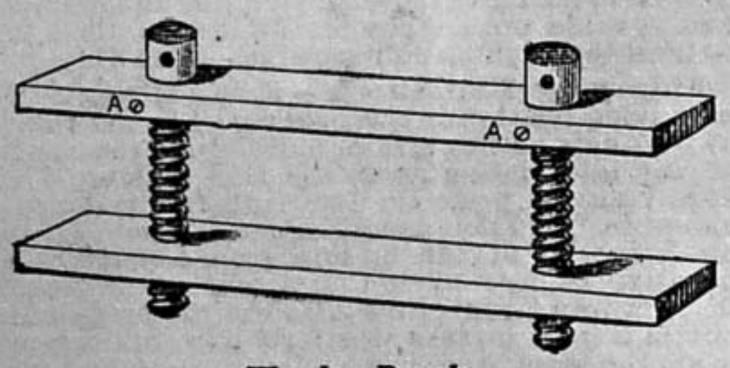
A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Double Bench Screw (Wood). — W. H. P. (*Hornsey*) writes:—"I think amateurs may find the enclosed sketch of a tool useful in more ways than one. I bought one some time ago, and have found it answer very well for bookbinding, as it is



Wooden Bench.

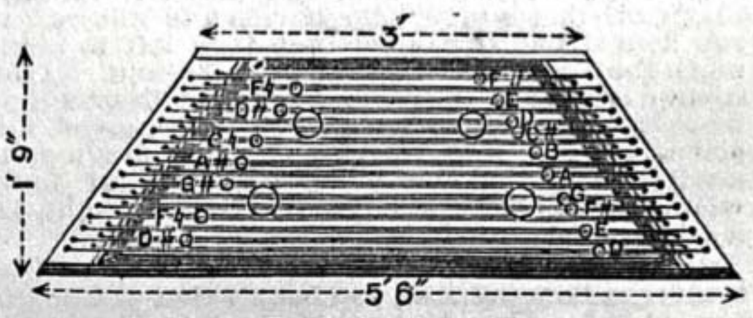
much cheaper than a press, and answers the purpose. I fixed a screw in the top slab above each wood screw, so as to keep the side up to the head of wood screw marked A A. It would be better to have a wooden runner at each end, so as to make it run free. The price is about 5s."

Official Label for Exhibit.—J. W. H. writes to F. J. R. (*Cardiff*).—This has been returned to the secretary by the Post Office, and awaits your sending new address.

WORK Exhibition.—J. W. H. writes in answer to several correspondents, and for the benefit of other readers, that no admission tickets will be issued until the exhibits, which entitle the exhibitors to them, have been received, examined, and finally accepted. Applications for transfers of tickets to friends in London should be made *only* after 20th December next. In reply to letters from country readers, London exhibitors have no privileges whatever beyond being on an equality with those in the country. They have to pack their exhibits, send them by carrier, and will not be allowed to enter the Exhibition until after the jurors' awards have been made—*i.e.*, before the public opening. Thus perfect fairness, irrespective of distance, will be maintained for all alike. The above applies also to Mr. Thomas Jorrance, 47, Blue Vale, Glasgow, and to Mr. George F. Crowther, 6, Park Road, Lewisham High Road, S.E. All changes of address should be communicated to the secretary immediately. N. B.—When exhibitors prefer to save trouble and expense by enclosing several exhibits, either of their own or of other exhibitors, in *one* case or package, they may do so if they affix *all* the official labels referring thereto to the outside of package.

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Bass and Octave Dulcimers. — A PLAYER (*Welshpool*).—I am very pleased that you have been so successful in the construction of your D dulcimers, and hope your attempt at turning out the bass and octave instruments may be equally satisfactory. The bass is an instrument of somewhat different construction to the ordinary one, as it consists of seventeen notes, or rather semitones, only. Some are made of even less compass than this—viz., twelve notes; but the capabilities of these are necessarily so limited as to render them nearly useless. The dimensions of a bass of seventeen notes would be as follows:—Length in front, 5 ft. 6 in.; length at back, 3 ft.; from back to front, 1 ft. 9 in.; depth of shell, 4 in. The wood necessary for its construction would be, for the belly, yellow, or, preferably, Swiss pine finished to



Bass and Octave Dulcimer.

a thickness of ¼ in.; for the back, braces, facings, and inner bridges, ¾ pine; and beech for blocks and bridges. The construction of the shell is exactly the same as given in WORK for other dulcimers, except that the belly will not require grooving into the blocks, but will rest on beads of ½ in. square stuff fastened on by glue and brads to the inner side of the blocks, and it will also be necessary to strengthen the belly by three stays on the under side. These stays are of ¾ pine 1 in. deep in the centre, and tapering off to ¼ in. at each end, where they are to be let into the top edges of the braces. They are placed 6 in. from each edge of the belly and the third one 2 in. from the right of a line drawn straight across the centre. The inner bridges are placed 4 in. from the blocks on each side, and an additional one is introduced quite in the centre, thereby cleaning the centre stay. The stays are necessary to prevent the belly splitting, and the centre bridge is intended to give support and thus prevent "swamping" or "blowing." As the tension of the strings will be considerable, it is of the utmost importance that the joints should be thoroughly well made. The inside lining blocks should be of 1½ in. square stuff and all of exactly the same size, and it is on the top of these that the ½ in. bead for the support of the belly rests. When this bead is in place it should be ¾ in. below the top of the pin block, so that when the belly is fixed it may be ½ in. under. Four sound holes should be made at the same distance—viz., 10 in. from each block, the lower two 3 in., and the upper two 2 in. in diameter, and of course may be fitted with rings or frets as desired. The bridges should be 1¼ in. high and 1 in. diameter at base. They should be turned slightly hollow at the base so that they may stand on their outer rims. They should be placed ¼ in. from the blocks *on each side*, and herein lies the difference of the scale of the instrument, all other dulcimers having their upper register divided by bridges running down the centre (or nearly so) of the sounding board. When the work is so far advanced that the blocks may be set out, proceed as follows:—Draw two lines 1 in. apart down the centre part of each block, and, allowing 1½ in. at bottom and 2 in. at top, divide the intervening space on the *outer* line of the right hand, and the *inner* line of the left, into fifteen, so that you have seventeen marks on each line. Mark these well with a punch or pointed awl and *number* them from the bottom. Now bore numbers 1, 3, 5, 6, 8, 10, 12, 13, 15, and 17 on the right, and numbers 2, 4, 7, 9, 11, 14, and 16 on the left for wrest-pins. Now mark the other two lines in the same way, but ½ in. lower down, and bore to correspond. The numbers between the wrest-pins in *each block* are occupied by the hitch-pins, so that you have twenty wrest- and fourteen hitch-pins on the right-hand side, and twenty hitch- and fourteen wrest-pins on the left. Put your hitch-pins, 1 in. long and made of No. 10 (B.W.G.) iron wire, in first and level off, leaving ¼ in. above the block, then insert the wrest-pins, ordinary piano-pins, and the instrument is ready for stringing. I have been thus particular in describing the setting out of the blocks, as an error once made is not easily rectified, especially if the holes have been bored. You will observe that provision has only been made for two strings to each note, and this is all that will be required, they being of the kind known as covered, "open" and "close." The "close" covered are used for the lower, and the "open" for the upper notes. You will have to get these strings made, which you can do by sending to Messrs. Chilvers & Co., Norwich. In stringing up commence with the stoutest strings, D hitching on the left and winding on the right; the next, D♯, is hitched on the right and wound on the left; and so on till the stringing is completed. The scale is shown in the accompanying diagram, from which it will be seen that it is unequally divided, and although this may appear at first sight rather awkward, it requires very little practice to get into the way of handling it, and being chromatic, any music that is written for the double bass (that lies within its compass) may be performed upon it. The beaters should be fairly heavy and well clothed and of a convenient length (about 13 in.), and, by way of variety, they may occasionally be laid aside and the strings plucked with the fingers instead. The octave or piccolo is simply a D in miniature, being exactly half the size of that instrument; it is easy, therefore, to work out the proportions by simply dividing the dimensions of a D by two, and working to that scale till the body is complete. The bridges, however, must be ¾ in. high, and ⅝ in. at base, with ½ in. top, and the pegs 1 in. long with square instead of oblong heads, while the strings should be all of steel, No. 8 for the first six notes, No. 7 for the next eight, and No. 6 for the remainder. As its name implies, it is tuned an octave higher than the D, and the beaters should be very thinly and tightly covered.—R. F.

Diagonals.—J. L. P. (*Airdrie*).—A diagonal is a straight line joining two opposite angles of any quadrilateral—*i.e.*, four-sided figure. Thus, in the illustration, the lines A B and C D respectively are diagonals. To find the diagonal of any given square, as you ask, merely draw a straight line from any angle to the one opposite, as from A to B. Now we know from the 47th proposition of the first book of Euclid, that the square described on A B is equal to the squares on A D and D B added together, or—

$$A\,B^2 = A\,D^2 + D\,B^2;$$

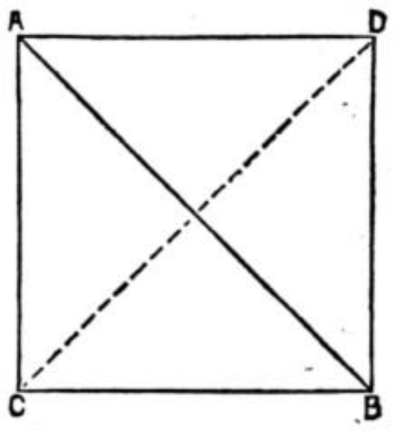
but A D and D B are equal, because they are both sides of a square: therefore—

$$A\,B^2 = 2(A\,D)^2.$$

By taking the square root of each side of the equation, we obtain the length of A B, our diagonal, as—

$$A\,B = \sqrt{2\,(A\,D)^2} = A\,D\,\sqrt{2}$$

In case you do not understand algebra, I will give an example with figures, so that you can substitute your own. Let the side of the square be 3 in. long; then A D will be 3 in., and D B will also be 3 in. We wish to find the length of A B; let us call this x; then x squared equals A D squared (that is 3 × 3) and D B squared (again 3 × 3) added together, or—



A Square, showing Diagonals, A B and C D.

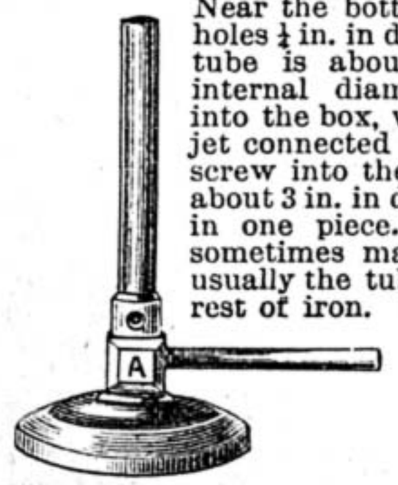
$$x^2 = A\,D^2 + D\,B^2$$
$$x^2 = 3^2 + 3^2$$
$$x^2 = 9 + 9$$
$$x^2 = 18$$

then x will be found by taking the square root of 18, or—

$$x = \sqrt{18} = 4{\cdot}2426106, \text{ etc.}$$

This requires that you should know how to extract the square root of any number. Probably it will be sufficient for you to draw a figure carefully to scale and measure; this will give you a fairly accurate result, but if you wish to know more exactly, write again, and give the length of the side of the square.—F. B. C.

Bunsen Burner.—HARO.—In a Bunsen burner the gas is conveyed through a narrow jet into a wide tube at the base of which are several holes to admit air. When the gas is turned on, a quantity of air, about twice the volume of the gas, is drawn in through the holes, and the mixture of gas and air is ignited at the orifice of the wide tube. The upright tube is generally 2¾ in. long by ⅜ in. internal diameter, and screws into the box A. Near the bottom of this tube are two holes ¼ in. in diameter. The horizontal tube is about 2¼ in. long by $\frac{5}{16}$ in. internal diameter, and also screws into the box, which contains a narrow jet connected with it. The box may screw into the circular foot, which is about 3 in. in diameter, or both may be in one piece. The whole burner is sometimes made of brass, but more usually the tubes are of brass, and the rest of iron. As they are sold at 1s. each, it would not be worth your while to make one. You do not give any address, but, presuming that you live in London, you can get burners, and any other chemical apparatus, of Townson & Mercer, Bishopsgate Street Within, or of Orme & Co., 65, Barbican.—F. B. C.



Bunsen Burner.

Jewellers' Waste.—DIAMOND MOUNTER.—*Re* the best way to treat the general waste material of a jeweller's workshop, in order to reduce the loss in working gold and silver to a minimum. First, for literature on the subject, it is, I believe, only written on in one book, "The Goldsmiths' Handbook," by George E. Gee, published by Crosby Lockwood and Co., price 3s., to which reference can be made for further details. From our own personal practice what follows is derived. The lemel is kept as free from impurities as possible, even from polishing materials; as for base metal filings produced in making patterns, we rigorously insist on their

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being kept quite apart for separate treatment, and for that purpose a special box or drawer is provided for them, until such times as we melt the packet of grains left from the sweep after grinding. At the regular weighing up, be it weekly, fortnightly, or monthly, the lemel should be well looked over, and all pieces of wire drills and other things picked out; and at the same time take out all the pieces of gold and silver that can be seen, this latter being weighed up with the other scrap that the man may be returning. Then burn the remainder in an iron ladle or tray in which a layer of stout paper is previously placed. When the lemel ceases to smoke it will be thoroughly burnt; then pound it up in the mortar and spread it out on paper, so that by passing the magnet through it a few times all wire and filings from steel and iron are extracted. Keep this separate for later treatment. Now, and not before, should the lemel be weighed in. The allowance for loss in working given in Gee's book is 6 grains per ounce troy. This, I suppose, is a fair allowance, but should only be granted if the lemel is very clean. There cannot be a hard and fast rule for this, for there must be more waste in making carved, pierced, or open work than there is in plain and solid articles. Every master must think this out for himself. In checking the amount used and returned, if the difference is much, I have the one man's lemel melted separately and assayed, then if there is less than there should be, I warn the man that his gold account is not correct; if there be a surplus, as sometimes happens, then I carefully check the weight of every article, and pay particular attention to the quality of his filings. To be always doing this would be irksome, so my chief trust lays in the knowledge that all the men know that there is one portion selected now and then—this portion thoroughly gone into without his knowledge. While the lemel is being pounded up, it is as well to use the fire to anneal the melting pots, so that if they are to crack on the application of heat they may do so before the gold, etc., is in them. The simplest way of melting lemel is with powdered pearlash as flux. This method is only one of several, and its success depends on the *absence* of iron, therefore special care must be taken to remove all that is possible, for if we do not we shall have to remelt it, and use saltpetre as a flux. About one-fourth of powdered pearlash, well mixed, will do to start with; the mixture is to be placed in an annealed pot, but not within an inch of the top. The size of the pot should be such that at least half of the mixture can go in at first, the remainder being added as the mass sinks in the pot. Two details, often followed out for the sake of safety, are: first, the placing of an old pot under the one containing the lemel, to form a secure base, and to retain the metal and flux should there be an accident after all; second, keeping the fire low, so that it can be made up at the time the pot is inserted, thus gradually applying the heat. In the course of an hour or two, or more, according to the quantity dealt with and the heat obtained, the flux should be in a completely fluid state. It may, however, form a kind of crust or cake; if it does, then add more powdered pearlash; if it appears as if it will boil over, then add a little dry powdered common salt. Experience only can teach if more heat is required; but if a portion of the flux is taken out on the tip of the poker, and if this is smooth and uniform both as regards colour and density, and if, on breaking, no trace of metal is seen, or the composition of one part in no way differs from the rest, then we may think about pouring it. If the flux does not appear thus, then make up the fire again, and give it more pearlash, and, if you like, a little borax too. The ingot mould should be well warmed and slightly greased; it should be quite large enough; and, personally, I would be sure to have an open ingot mould, or skillet. The molten mass should be poured rather quickly, for then the flux will float to the top. If a closed skillet must be used, then use the poker to hold back the flux by placing it across the mouth of the pot, at such a distance that no impediment is offered to the run of the molten metal. On the appearance of the ingot when cold will depend the answer to the question—Is it good enough to assay as it is? When it is clearly melted, then cut off at least 12 grains (½ dwt.), and send it to Johnson, Matthey & Co., Hatton Garden, for parting assay. This costs 1s. 6d., and gives the exact quantities of fine gold and silver in the pound troy; from this one can get at the value, and so compare with the gold book. At my place we obtain an offer, and afterwards sell it to the refiners, for we know now that refining on a small scale does not pay. So much for the lemel; now for a few words about the floor sweep. The principle on which this is worked is that all the material that can contain gold is treasured, and all such stuff as coke and ashes from the heating stove is thrown away. The floor should be swept at least once, but better if done twice daily. If the expense can be allowed, it is best to have the floor covered with zinc, and just where the men are there should be wooden gratings; such improvements as these will soon pay for themselves. The sweep is to be well looked over for gems, pieces of gold, etc., and at the end of one or two weeks it should be burnt and sifted. After which it can go into the sweep-box; this being the receptacle for all secondary matters that may have precious metal in them, such as old metal pots, flux, etc. When the accumulation of sweep is sufficient, it should be ground (Simpson & Co., Chiswell Street, E.C., is a good firm), and offers obtained from two or three refiners for it. As for the residue, the grains, etc., they should be melted with the brass filings, and polishings, and residue of colouring water—that is, if there is not enough of the latter to keep separate. As for the water from washing the hands, which must always be done before a man leaves the workshop, this water is run into some large receptacle, and when it is quite full the pipe is changed into another tub or jar. Gee recommends strongly a solution of photo-sulphate of iron (green copperas), 2 ounces to 16 ounces boiling water. This is to be added, and the pan or tub is to be left undisturbed for a day or two before the water is drawn off by a syphon, so as not to disturb the sediment. As soon as it runs cloudy, then stop, for some gold will be sure to come out too. Of course, after some months' use the sediment will have accumulated, then it has got to be dried and burnt previous to being added to the sweep. The way of doing that is by making two strainers, one of coarse canvas, and under that another of finer canvas or cloth; under that, again, a tub to catch all that runs through, which, if clear, is allowed to run away; but if cloudy, then it is left to stand until the sediment rests on the bottom. After some days the muddy mass will get thicker and more like clay; then, as it can be easily moved, it is placed in some iron vessel, and burnt previous to mixing with the sweep. The furnace or forge where this is done should have a good draught, for it smells strongly.—H. S. G.

Gipsy Table.—G. A. (*Pembroke Dock*).—Gipsy tables can be purchased so cheaply that you might aim at something higher. However, obtain the octagon by drawing a circle on a board, divided by two cross lines and two diagonal lines, all running through the centre, into eight equal parts; and draw straight lines across from different points where they touch the line of the circle. The tops are usually 18 in. each way, and about ½ in. thick. Turn the legs from 1¼ in. or 1½ in. stuff. They will be in six parts, each about 14 in. long, their ends entering a middle ball, three above and three below it, by means of screws (Fig. 3). The

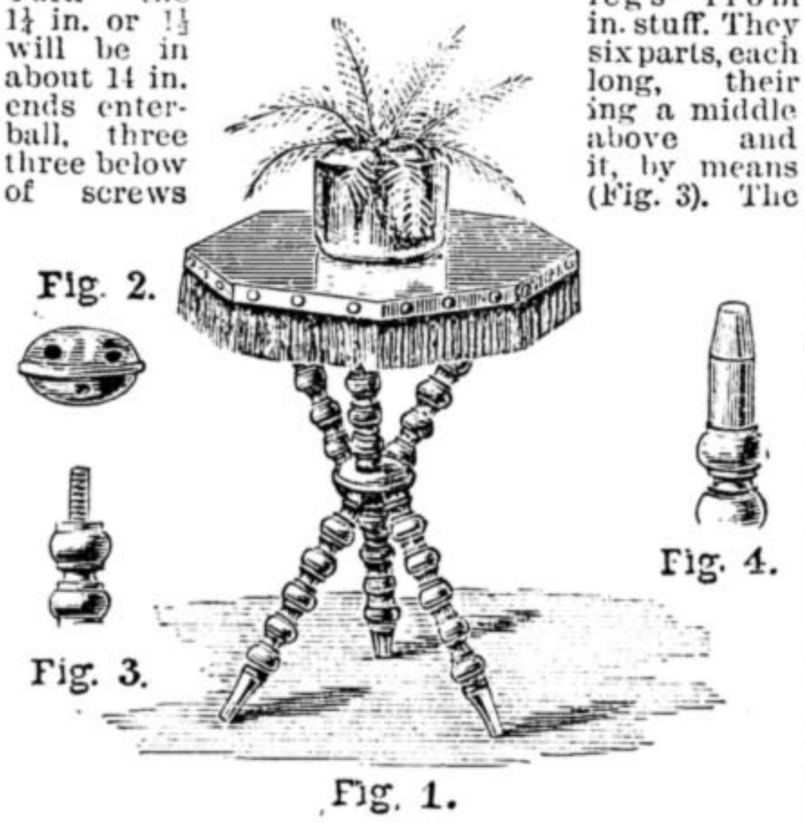

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1.

Fig. 1.—Gipsy Table. Fig. 2.—Ball to which Columns are screwed. Fig. 3.—End of Columns to screw into Ball. Fig. 4.—End of Columns to join to Table underneath Top.

ball will be one piece, with three holes forming a triangle in the top, and another three holes forming a reverse triangle underneath it. The top of the columns will be as in Fig. 4, entering holes, and being glued, underneath table top. The tops are generally covered in some fabric, and fringe secured round the edge by means of plush- or brass-headed studs. "Aspinalling" or "Foo-chowing" all over, however, will answer. Height of table should be about 27 in. or 28 in.—J. S.

Small Foundry Plant.—R. W. (*Liverpool*).—To cast from 15 cwt. to 1 ton per day, you will want a cupola 18 in. diameter inside the bricks, and about 9 ft. high. The casing will be of sheet iron riveted together, and a course of bricks a single brick deep, properly arranged as "headers" or radially, will do. The charging may be done through the open top, a couple of feet or so above a platform, thus avoiding the usual charging door employed in larger cupolas. A single tuyere from 3 in. to 3½ in. in diameter will suffice—say, 16 in. in height above the bed. The tapping hole will be 6 in. high from the bed, and the slagging hole 12 in. high. To melt a ton of metal, a bed charge of 2 cwt. of hard coke will be required, then alternate layers of 5 cwt. of iron and ½ cwt. of coke. The blast may be supplied with a fan of about 18 in. diameter, or a No. 1 A Root's blower, driven by a one-horse-power engine. You will want at least 10 tons or 12 tons of sand, Doncaster, Kippax, Snaith, Worcester, Falkirk, according to the class of work you mean to do. This may average, say, 4s. to 6s. per ton, besides carriage, which is heavy. You will also want a few tons of pig and scrap at current prices; of hard coke a few tons. Moulding flasks you can make of wood for a beginning, but had better use iron. These you can mould in open sand yourself, and they will then cost the value of the metal plus the cost of melting—say, 4s. per ton plus the value of your labour. Half a dozen sieves and riddles for sand, a water-can, a bucket, a shovel, a wheelbarrow, a sledge hammer, and small tools. You should have a small forge, because there is so much wrought iron work required about the fitting of flasks, drawback plates, clamps, and so on. There will be scales for weighing iron for purposes of mixing, ladles for casting, a small crane for hoisting the larger flasks and the heavier castings. A small stock of wrought iron for rods, clamps, etc. A loam mill if you want to do loam work, a core stone, plumbago, oil, etc. etc. The size of foundry and number of men will depend upon the class of work you want to do. Thus you may make a single plain casting that will require the full capacity of your cupola, or you may make hundreds of castings of a few ounces or pounds each. In the first case one man may suffice; in the other you may want half a dozen men and boys. Perhaps a foundry from 20 ft. to 30 ft. square would suit your requirements, and one moulder who can make his own cores, with a handy labourer and a boy to assist him. The labourer can attend to the cupola, cleaning it out in the morning, re-lining it and the ladles with sand, building the fire, breaking up the iron, and weighing it and the coke. If you make a large quantity of light castings, you will want a lad to give his whole time to fettling them, for which chisels, files, and an emery wheel are required. The building itself may be of brick or stone, and the walls should be thick and stout enough to stand the stress of a wall crane or light overhead traveller. Make it lofty, and well ventilate it to carry off the heat and fumes from the moulds and stove. The cupola may be placed inside the foundry, but is better outside, with the tapping hole and gutter coming through the wall inside the building. The prices of materials vary so much in different localities, so much depends on business economy, that I cannot go into the details of cost for all this. Roughly, you cannot put it up brand-new for less than £300. Makeshifts can be purchased, as is often done, and second-hand plant bought, and the cost reduced thus by one-third, or even one-half. All that you want reckon out in detail for yourself, according to circumstances.—J.

Superfluous Hairs.—JOHN JACK.—I am sorry for your sister, but you write on a matter that cannot be dealt with in WORK.—ED.

Alkaline Coppering Solution.—W. P. (*Liverpool*).—Dissolve from 2 ounces to 3 ounces of good copper sulphate for each gallon of solution—that will be from 20 lbs. to 30 lbs. for your 180 gallon vat—in hot rain-water. Let this cool, then add liquor ammonia with brisk stirring, until all the copper has been thrown down as a green precipitate, and all this has been dissolved by the ammonia to form a clear deep blue liquid. To this add a strong solution of best potassium cyanide until all the blue colour disappears, and the solution has the tint of old ale. Allow this to rest for twelve hours, exposed to the air, then filter through calico into the coppering vat, and add rain-water to make up the required bulk. You may make it up with more copper to the gallon if you want a quick deposit; anything from 2 ounces to 8 ounces will work fairly well. It will take about 1 quart of ammonia to each pound of copper sulphate, but it will be safer to trust to the results given above, and add ammonia and cyanide until these results are obtained, than to trust to weights and measures.—G. E. B.

Enlarging Exposures.—E. E. (*Penge*).—You are giving too short exposures, and I do not wonder at your only getting a faint outline. In the absence of any information as to the lens or stop, I can hardly advise you. On referring to my notes of exposure, I find that using Eastman's bromide paper and enlarging to 12 in. by 10 in. from a quarter-plate negative, using F 10 stop on a dull day in November, between 2 P.M. and 3 P.M., the time required to obtain a good picture was forty-five minutes, and using the same paper in a similar manner on a clear light day in March, the exposure required was fifteen minutes, both days using the light from a window facing north. I give you these as approximate exposures, but should advise you, when using the camera, to cut a strip of the paper you are using, say 1 in. wide; put it in your dark slide, keeping it about the centre, and expose on a negative in the camera for five minutes, then push in the shutter of the slide one-fourth of the way; wait another five minutes, push in half-way, wait again five minutes, then push in three-fourths, and give five minutes longer. You will thus have on the one strip of paper four different exposures; develop the strip, and see which exposure is nearest correct, then time your pictures accordingly: this is as good a way to set about the work as any, and you will learn more from exposing and developing a strip of bromide paper in this manner than I could possibly tell you in a page of WORK. Adhere strictly to the formulæ of the maker of the paper you use, and you will not fail to get good results, as the camera you have made so successfully is all that is necessary to produce good work. Should you want your pictures sharp and full of detail, use your smallest stop when exposing, of course increasing the time in proportion. Should you still find any difficulty in getting good pictures, write to me through the Editor, and as you reside within a reasonable distance, I will try and give you an evening of practical instruction.—G. LE B.

Annealing Steel Wire.—T. B. T. (*Thurlstone*).—I do not know if this process is now commercially successful, but it has been made the subject of several patents, the particulars of which you can obtain by searching in the Patent Office lists. It is necessary to exclude the atmosphere.—J.

Hydraulic Lifting Jack.—B. C. (*Doncaster*).—I gather that you want to know how to put your jack in order. You had better get a practical man

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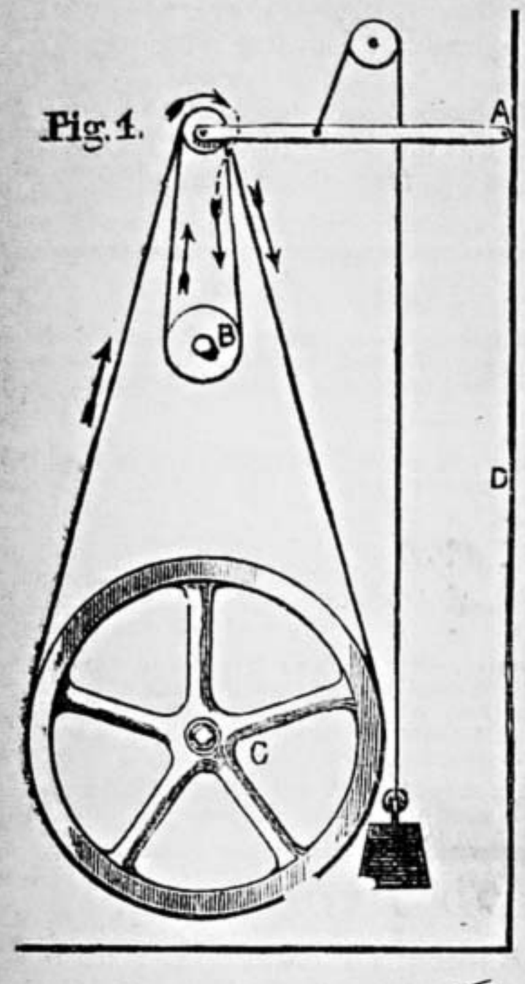
to look at it, and show you how the packings are put in, after that you will be able to tackle it yourself; very likely it is only new packings wanted.—J.

Lathe Fittings.—F. C. (*Belfast*).—If you are fitting up a 3 in. lathe, you should study my papers in the first fourteen numbers of WORK on "Lathes and Turning Appliances," and particularly the one on "How to Test a Lathe," as it will show you how to get the headstocks in line. Now, if you want to turn wood on your lathe, you should have the pulleys sized for quick speed—9 to 1 would be a good rate for the fastest speed. That is to say, when turning small work in wood the mandrel should make nine turns for every tread. Now for slow speed you should have the pulley on the mandrel as large as possible, because that gives more power and prevents the cord slipping. You may get in one of 4 in. diameter. The small groove may be 2 in. (if you like you can have one between them of 3 in.). Multiplying 2 by 9 you get the size of the groove in the fly wheel to be 18 in.—gives 9 to 1; if this drives the 3 in. groove on mandrel you get 6 to 1—that would suit hard wood of 3 in. or 4 in. diameter and small brass work. By driving on the 4 in. groove you get 4½ to 1, and that would suit small pins and screws of iron or steel, which you



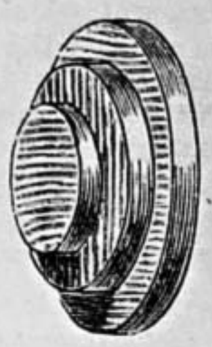


Fig. 1.

Fig. 2.

Fig. 3.

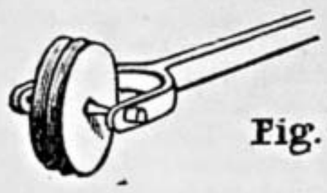


Fig. 5.

Lathe Fittings.

should be able to make on your little lathe. Your pulley on mandrel you can make of three boards of wood glued together, as in Fig. 1, the grain of the middle one to cross the grain of the two outer ones. Bore this through and drive it firmly on to the mandrel, and then turn and polish. The grooves are best cut to a sharp angle (see Fig. 2) about 50°, a little sharper than a three-square file, as in Fig. 3, 60°. The weight of your fly wheel should be from 45 lbs. to 50 lbs. There is an easy way to avoid having a second groove on fly wheel, and yet it requires only one belt. Over the mandrel about 12 in. you fix a tension pulley (see Fig. 5), which should be not less than 3 in. diameter, and be fixed on steel spindle to run between hard steel points, so that friction is almost imperceptible; there are two grooves in the pulley, as the band passes over twice, and these grooves must be exactly the same size. A weight holds up the arm of tension pulley, and cord or band may be of *cotton lay cord, long spliced*, no hook and eye to jerk. Fig. 4 is a tension pulley arrangement only suitable for small lathes. Your mandrel should be bored right through. I hope you will understand.—F. A. M.

Hardening Screw Taps.—Y. A. (*Darwen*).—I am not aware that taps are so hardened. They may be. Probably you are thinking of the practice of quenching in oil, but they are let down previous to that. Taps are often heated in a bath of lead previous to tempering.—J.

Engine to drive Thrashing Machine.—WELL WISHER.—Portable engines are commonly used for corn thrashing, but horizontal and vertical engines are also employed. It is impossible to comply with your request at present. If, however, you have any specific questions to put relative to general designs, dimensions, or details, I will reply so far as I can in "Shop."—J.

Sign Writing.—E. C. (*Notting Hill*).—The articles on "Sign Writing and Lettering" appeared in the following pages of WORK, Vol. I.:—10, 19, 55, 163, 197, 259, 292, 356, 467, 530, 614, 668, 677, 691, 713, 743, 775, 805, 812.—ED.

Incubator.—F. C. (*Birmingham*).—An article on the above is in the printer's hands, and will appear as soon as space can be found for it. This, I hope, will meet your requirements.—ED.

Telephone.—MACK.—There are many forms of telephones with horse-shoe magnets. The Gower-Bell is one of them, and I attach a drawing of it. Fig. 1 shows the external appearance of it, and Fig. 2 the internal. A is a horse-shoe magnet, generally

Fig. 1.

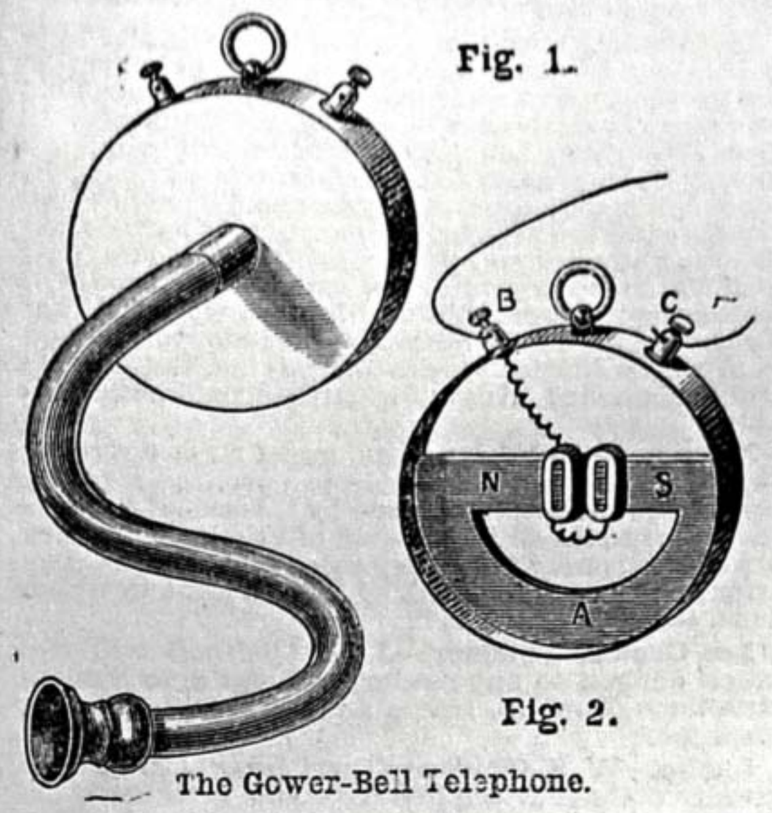


Fig. 2.

The Gower-Bell Telephone.

built up of thin plates of steel strongly magnetised on the poles. N, S are a pair of small bobbins filled with No. 36 silk-covered copper wire. These bobbins are connected to each other and to the terminals B and C on the outside of the case. Over the bobbins is fixed a sheet-iron disc, which of course answers the same purpose as in the other forms of telephones.—W. D.

Child's Rocking Chair.—R. R. (*Walsall*).—I cannot call to mind the "old-fashioned child's rocking chair made in three pieces" to which you allude. From the sketch I here give, you could make a strong, handy, inexpensive, and—with cushions—comfortable chair. Decide upon dimensions yourself. Make all parts quite 1 in. or 1¼ in. thick—the chair will, doubtless, receive some knocking about and cutting. Join the seat A to the sides B as in Fig. 2. The back would fit

Fig. 1

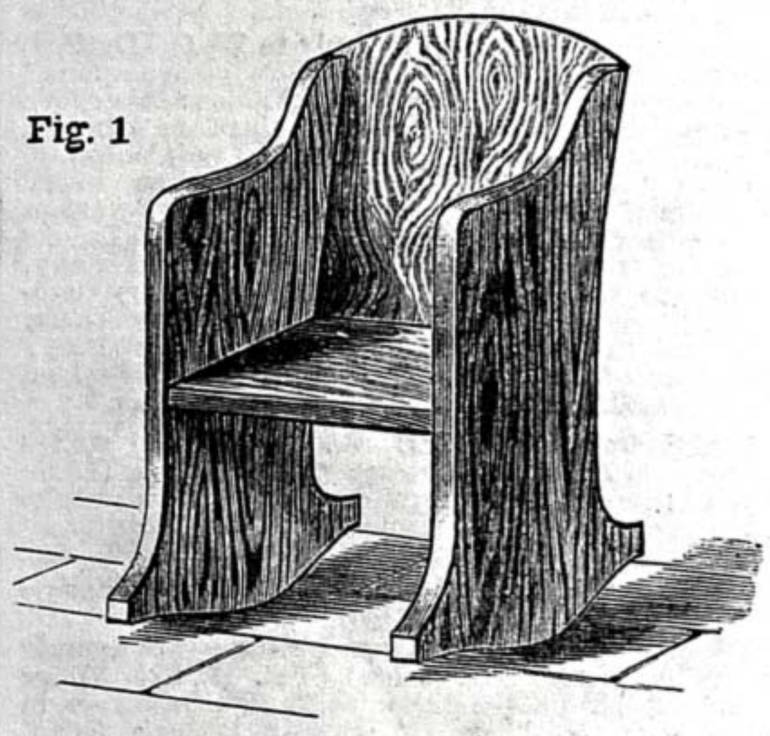


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1.—Child's Rocking Chair. Fig. 2.—Joint of Seat A and Sides B: elevation. Fig. 3.—Plan of Joint of Back D to Sides C. Fig. 4.—Elevation of Joint of Back D to Seat E.

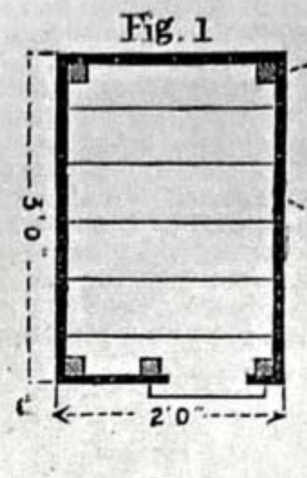
between the sides, and be screwed there. For additional strength, the back D might connect with the sides C, as in Fig. 3, and with the seat E, as in Fig. 4. A good strong wood should be used. If you have the rockers shaped at back and front, there will be no liability of any child overbalancing either way. Have a rail across the front, if necessary.—J. S.

Jensen Electric Bell.—ELECTRICAL INQUIRER.—In my article showing how to convert an ordinary handbell into an electric bell of the Jensen pattern (see page 227, Vol. II.), you will find full instructions and rules to guide you in getting the right proportions of the various parts. Two No. 2 or middle-sized Leclanché cells should be used to ring a 3 in. or 3½ in. electric bell through a short line wire. Try Messrs. Cox & Co., 11, Fetter Lane London, E.C.—G. E. B.

Violin and American Organ Papers.—LUX.—These are expected to appear in Vol. III. of WORK. In the meantime any specific question will be replied to in "Shop."

Dog Kennel.—E P. (*Strood*).—The accompanying sketches show a simple method of making a strong kennel, suitable for a retriever or collie dog. The framework is made of 2 in. by 2 in. yellow deal, and covered with 1 in. matchboards; the joints of roof being covered with weathered fillets, the floorboards (also of 1 in. matchboards) being nailed right on top of the bottom rails of framework. The first floorboard should be knotched out to form sill. A very good and simple way of protecting the animal from draughts is to

Fig. 1



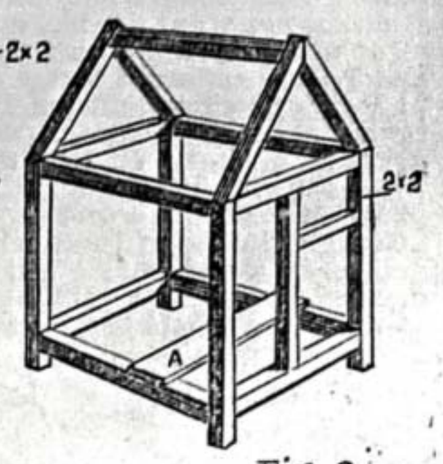


Fig. 2.

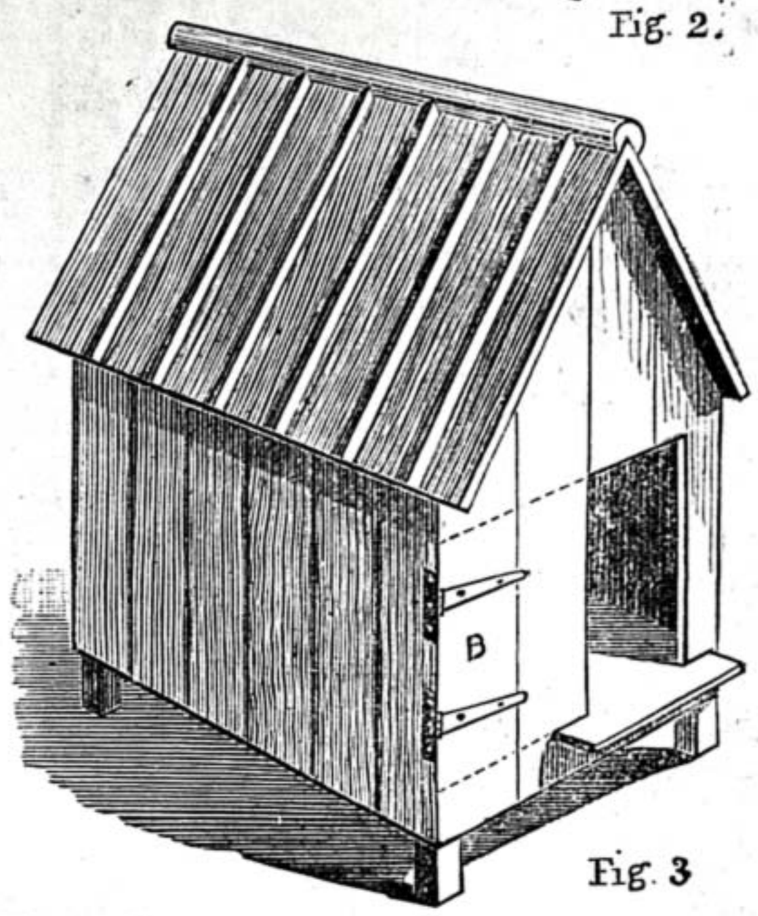


Fig. 3

Fig. 1.—Plan. Fig. 2.—View, showing Method of constructing Framework—A, Floorboard in Position. Fig. 3.—Completed Kennel.

hang a door that will cover the hole on the most unprotected side, and keep it open at the most convenient angle by means of a light iron stay or cabin hook. A still better way would be to also hang the whole of the part of front marked B; this you would find would enable you to clean it out very readily, and the supplementary door or flap would still be available for night-time.—E. D.

Polishing Overmantel.—A. C. (*Cowell, Rochford*).—You say you do not wish to French polish, but wish for the dull appearance of some you have seen in furniture dealers' windows. This leaves wax polish as the only alternative, particulars of which have already appeared in WORK. Failing your ability to do this to your satisfaction, you must go back to French polish, for most furniture dealers have theirs French polished, the dull appearance being given by well rubbing all over with fine emery and linseed oil or water applied with felt or woollen cloth, a hard brush, such as a shoe-brush, being used for the carvings and other awkward places; the work being first well "bodied up" and prepared as for spiriting; in lieu of which, dull down as directed.—W. J. M.

Ironing Morocco.—SCRIBER.—You are correct in your supposition that at the joint the edges of the skins must be bevelled off. Practice is necessary. Experiment with bits of waste stuff. Use good strong paste, such as bookbinders use. The tooling, either gilt or plain, you had better get done for you by a bookbinder; it is not ordinarily done by an upholsterer. If you can get hold of someone who lines table tops and puts the gilt on them, he will be just the man you want. There is probably someone in your city who does this kind of work for the cabinet makers or house furnishers.—D. D.

Phonograph.—S. D. (*Lifford*).—You ask "how to make the diaphragm and mouthpiece for phonograph," and also for the sizes of all the parts, and where to buy the materials. Complete instructions are about to be given for making one, as well as sizes of the different parts. The parts are not on sale.—W. D.

Specimens of Ores.—J. C. (*Aberdeen*).—For samples and prices of ores see the advertisements in "Science Gossip," published by Chatto and Windus, Piccadilly, London, and write for price lists. Probably an advertisement in the "Sale and Exchange" column of WORK would bring a cheap collection before your notice.—F. B. C.

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Folding Screen.—H. B. (*Kentish Town*).—I was about to mildly "warm you up," as the workshop phrase has it; but I have refrained from so doing by considering the fact of your being a new subscriber. The reason I was on the verge of censuring you is because you have acted similarly to hundreds of readers—you fail to explain full particulars in connection with your requirements. Your desire is for a screen upon which you wish to display a quantity of scraps at present in your possession. You ask what material, joints, and dimensions are necessary. Every item is really a matter of preference. You neither state about what number of scraps you have; whether you want a table, door, or fireplace screen; all of which are sometimes made to fold. Figs. 2, 3, 4, and 5 show different forms of joints; perhaps that in Fig. 5 (mortice and tenon) will be the best and strongest for the purpose. Of course, the bottom connections must be slightly different from some of those shown. If you carry the frames down an inch or so, you can put a foot at each end of the whole article. The use of these will be noticed when the article is straightened out in one length. It is curious, but it is a fact, that but few screens are so treated, and would tumble when in such a position.

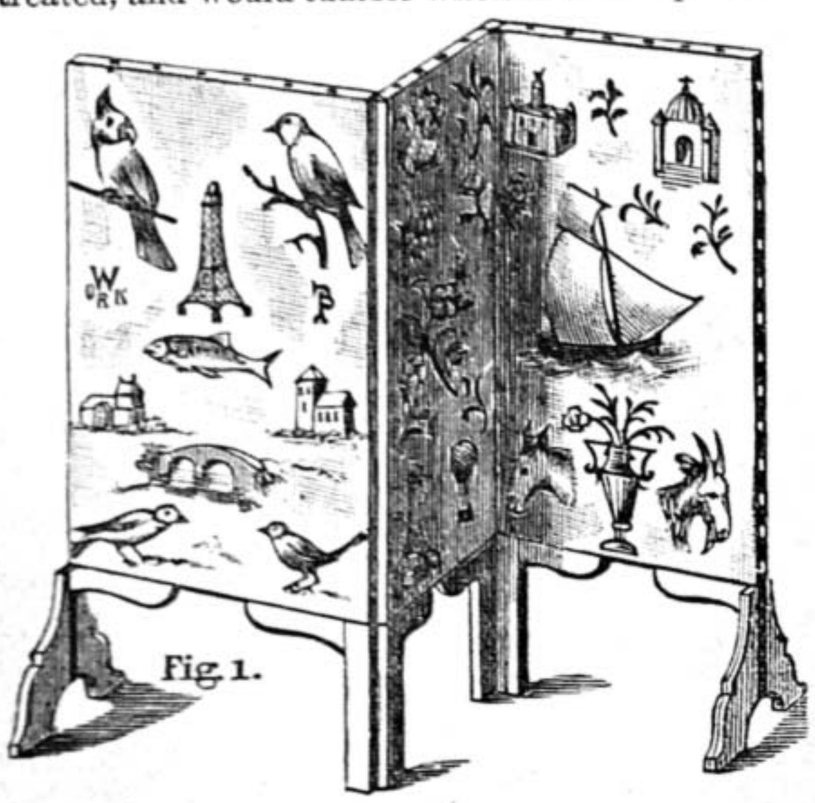

Fig. 1.

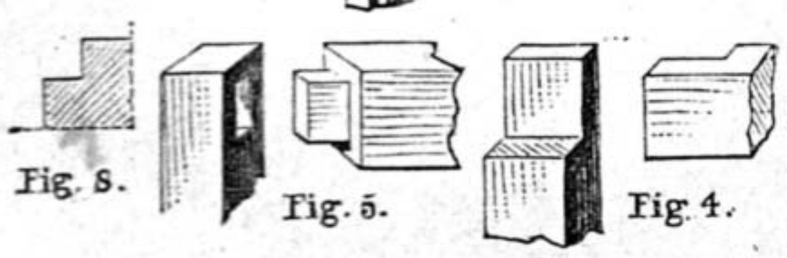

Fig. 8. Fig. 5. Fig. 4.

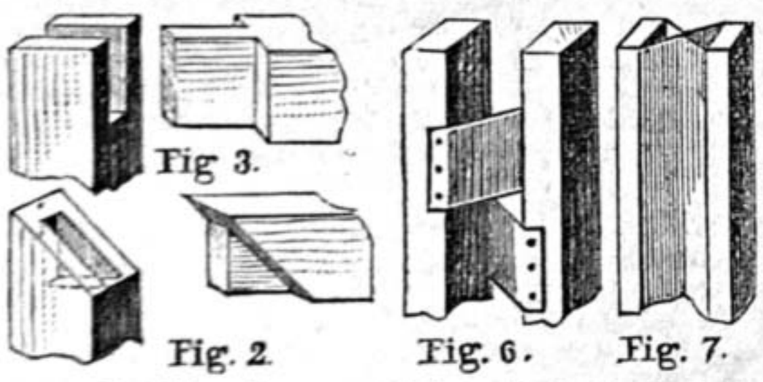

Fig. 3.

Fig. 2.

Fig. 6. Fig. 7.

Fig. 1.—Folding Screen. Figs. 2, 3, 4, and 5.—Various Forms of Joints. Fig. 6.—The Folding Connection. Fig. 7.—Material between the Frames pleted for folding. Fig. 8.—Section.

If you want feet at the extremity of each frame, you must study the article a little, for it will be an awkward matter to fold the screen if all the feet are placed symmetrically. Personally, I should use American cloth as a good material whereon to display the scraps; but your wife, sweetheart, or sister, if you have either or two of the three, will decide upon a suitable material in this direction; put the corners as in Fig. 6, and tack the edges on the top, etc., of the screen with brass-headed studs. You will have to cut a larger piece out of the bottom corners. You will thus have two thicknesses of material on those parts—*i.e.*, the edges of that on each side of it. For folding connections you could adopt the simple method used in a "clothes horse," shown in Fig. 6; and you could also have the covering material over those parts folded as in Fig. 7, to allow all to close properly. Where necessary, glue it to the wood. There is no fixed rule respecting sizes; therefore I must ask you to please work these out for yourself. There have been a few designs of screens, and notes upon the same things, in back numbers. Obtain an Index of Vol. I. and all past numbers of Vol. II. from your nearest bookseller; you will be rewarded in a hundred directions by so doing.—J. S.

Frosting Lathe Bed.—NO NAME (*Kidderminster*).—Frosting is done with the scrape, carried over the surface in arcs of circles instead of straight forward. There is a little knack in this work, readily acquired by practice.—J.

Monogram.—W. J. B. (*Maidenhead*).—If you want a monogram you cannot do better than design one after your own heart and fancy. Get Vere Foster's, or any other publisher's, book of ornamental letterings. Select the style of letter you like, then amuse yourself by entwining the three letters forming your own particular monogram.—C.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Toy Balloons.—E. B. (*Liverpool*) writes:—"Will any reader oblige me with instructions how to make toy balloons—not paper ones—and also how to fill them with a very light gas? Also about what they would cost?"

Lenses.—READER FROM START writes:—"Is it within the scope of an amateur who has most of the necessary apparatus to make his own lenses? If so, can serviceable ones be made from ordinary plate glass? Can they be partly roughed down by a lathe tool, or is it necessary to take the whole off by grinding? Are large lenses usually cast, and what descriptions of glass are used for this purpose? What relation has the diameter and thickness of a lens to its focal length, and what are the usual dimensions of lenses for photographic and lantern work? What means are used to remedy spherical aberration, and is there no known means of making the surface truly parabolic? Any information would be acceptable."

Rotary Brush.—READER FROM START writes:—"As I have not been able to purchase a rotary brush, I propose to make one by the aid of hints in 'Shop' as to the different kind of bristles, how they are put in, and where they can be obtained. Any 'tips' will be appreciated. I have a lathe in which I can turn the cylinder."

Ice Cream Freezer.—J. R. (*Belfast*) will feel much obliged to any reader who will give him instructions how to make an ice cream freezing machine.

Lathe.—W. S. (*Stockport*) writes:—"I should be greatly obliged if any reader could give me a description and sketch of an 'easily made wood-turning lathe.' The lathe is to be made mostly of wood."

Bruises in Plate.—APPRENTICE writes:—"Will anyone who knows kindly tell me how bruises in plate, such as cream-jugs, hot-water jugs, with narrow necks, are removed from goods so as not to disfigure the articles outside? I should be glad of a few wrinkles, and a sketch to the best adopted stakes for the purpose."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Artificial Eyes.—H. V. T. writes in reply to F. T. (*London, N.*) (see page 522, Vol. II.):—"I believe there is no re-enamelling of artificial eyes, and that when the surface is roughened by the moisture or secretions, the only remedy is to have a new 'prise,' as it is called; but F. T. could doubtless get information of Messrs. Young, 50, Upper Tollington Park, Finsbury Park, N., who are specialists in this line."

Collieries.—M. writes in reply to W. G. (*Dudley*) (see page 538, Vol. II.):—"The following are some of the principal collieries in South Wales: Aberdare Merthyr Steam Coal Company, Aberdare Rhonda Steam Coal Company, Aber Rhonda Coal Company, Brynda Coal and Coke Company, Briton Ferry Coal and Pottery Company, Cardiff and Swansea Smokeless Coal Company, Oakwood Slat and Levels Colliery, Dinas Main Coal and Coke Company, Garmuntz Collieries Company, Hook Colliery Company, Raven Coal Company, and numerous others. For a full list see the 'Colliery Guide and Directory.' The *South Wales Daily News* and the *Western Mail*, Cardiff papers, have a good circulation."

Wood Carving.—R. H. W. (*Lewisham*) writes in reply to A BEGINNER (see page 538, Vol. II.):—"I can thoroughly recommend as useful two books lately published: 'Exercises on Wood-working.' Ivin Sickels. D. Appleton. New York, 1890. 5s.; and 'A Manual of Wood-carving.' C. Leyland. Revised by Holtzapffel (Whittaker & Co.). 5s."

Tin-plate Work.—TINKER writes:—"In answer to A. T. S. (*New Swindon*) (Vol. II., No. 85) *re* Warn's book on tin-plate work. The address in mine is R. H. Warn, 94, St. Augustine's Road, Camden Square, N.W., price 10s. 6d. But in case A. T. S. cannot obtain one from there (as the date in mine is 1884), I would refer him to the *English Mechanic*, where an occasional advertisement of the book occurs."

Weighing Machine.—WORKER BEE writes to M. N. W. (*Wells*) (see page 538, Vol. II.):—"I would dissuade M. N. W. from spending his money and time on his weighing machine until he has satisfied himself that when complete it will meet the requirements of the last Weights and Measures Act. Up to December 31st of this year inspectors may stamp out old pattern machines that they are satisfied are serviceable, but after that date they are forbidden *to stamp any weight, measure, or weighing machine not previously in use that are not of a certain pattern* specified by the Act. M. N. W. will be wise to 'go slow.'"

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—FAUST UP TO DATE; G. H. (*Walworth*); KILOMÉTRIQUE; SHOBBY; G. W. (*Brockley*); WORKIST; SOUTH WALES; C. T. (*Ashton-under-Lyne*); P. W. (*Leeds*); J. D. (*Devon*); G. W. P. (*Putney*); LARA; W. P. (*Cardiff*); THE JAY; G. H. T. (*Ilfracombe*); A. C. (*Kent*); G. W. (*Plumstead*); E. E. U. (*Bushey*); MOTIVE; T. S. (*Walsall*); H. B. T. (*Brixton*); WREST PLANK; A SUBSCRIBER FROM THE FIRST; P. J. A. (*Seacombe*); IDEM SONANTIA; A. H. E. (*London, W.*); F. C. J. (*Camberwell, S.E.*); C. J. S. (*Trimsaran, South Wales*); J. B. (*London, W.C.*); S. S. (*Salford*); VIOLIN; H. J. C. (*London, S.E.*); TINMAN; R. J. W. (*London, S.W.*); THE LAST SHALL BE FIRST; L. S. L. (*Kirkcaldy, N.B.*); A CONSTANT READER; J. T.; J. H. S. (*Burnley*); A. B. C. (*Malta*); L. T. (*Marlborough*); F. E. B.; G. S. (*Burnley*); WINDERMERE; G. B. (*Poplar, E.*); DANSON (*Grasmere*); CABINET MAKER; J. M. (*Midhurst*); G. R. E. (*Manchester*); TIN-PLATE WORKER; T. H. B. (*Wesham*); SNOB.

"WORK" EXHIBITION.

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IN connection with the "Work" Exhibition to be held at the Polytechnic Institute, Regent Street, London, W., from December 29, 1890, to January 10, 1891, inclusive, a Special Exhibition Number of WORK (separate from the weekly or monthly issue) will be issued on December 31, 1890, price 3d. This Number will consist of 32 pages in a wrapper, and will contain an Illustrated Descriptive Account of the most remarkable Exhibits.

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Saw Benches for hand or foot power; new patent. Illustrated Catalogues free.—LEWIS and LEWIS, Cambridge Heath Station, London, N.E. [5 S

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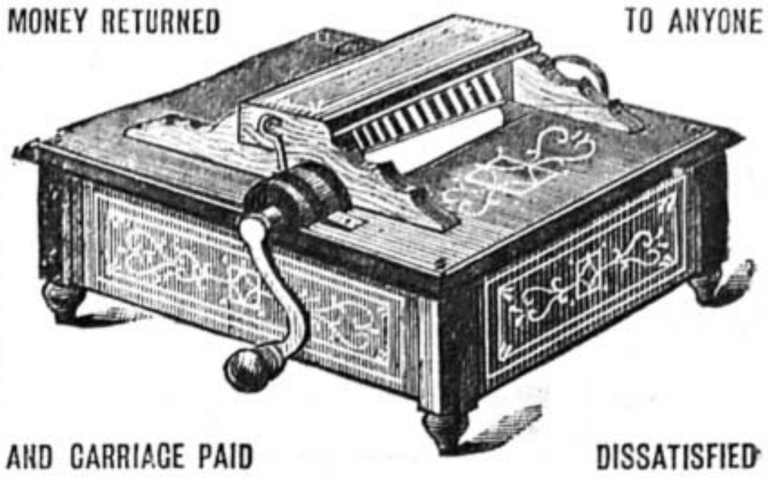

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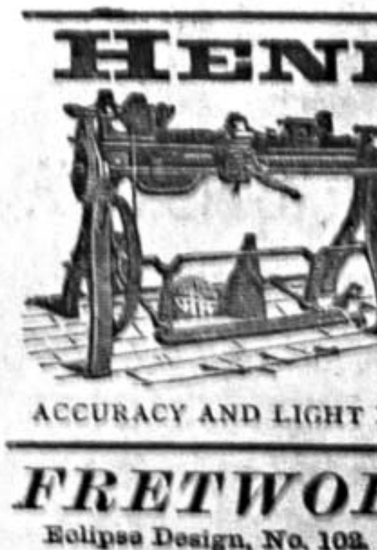

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